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COMMITTEE ON EDUCATIONAL RESEARCH  
*The University of Alberta*





## *Editorial Comment*

The Editorial Board expresses its appreciation to Dr. Gordon Eastwood who served as editor of the Journal from December, 1965 to September, 1967. He continued the work of Dr. H. E. Smith in setting increasingly high standards for the publication. The contribution made by Dr. Eastwood can be evaluated in part from the direct evidence presented in each issue of the Journal. Dr. Eastwood initiated the publication of two special "theme" issues which have been well-received in the field of educational research. The revised format extended the range of types of manuscripts which could be reproduced in the pages of the Journal. In each issue, too, was evidence of Dr. Eastwood's support of young scholars who had significant contributions to make, as well as his success in publishing the works of established researchers and authors.

In addition to this direct evidence available to all readers, the new editor has had the opportunity to observe the demanding criteria that were used by Dr. Eastwood to evaluate the total production and management of the Journal. It is with trepidation that we promise to try to meet these same criteria! We wish Dr. Eastwood well in his new position as Head of the Department of Social and Philosophical Foundations at Simon Fraser University. The one consolation in losing him as editor is that we have regained a contributor whose ideas are always stimulating.

A change in editorship usually implies changes in editorial policy. These changes may be directly stated or they may be implicit in the interpretation and implementation of previously stated policy. At this point, we would like to reaffirm the policy described in the "Editorial Comment", March, 1966, with respect to types of manuscripts acceptable for publication in the Journal. Manuscripts on hand exemplify most of the types of articles described in that editorial: "... manuscripts devoted to any and every type of research—empirical, philosophical, historical, etc.—; to exposition, criticism, or evaluation of research designs or programmes; to any aspect of the logical bases of research; to ways and means of more effectively using research resources; to methods that can be used to translate and interpret the specialized reports of researchers for practising educators; and particularly to the education of research personnel in sufficient numbers and with proficiencies appropriate for the many areas in which research activity is necessary."

In the first article, Eastwood questions the use of statistical tests designed to confirm a hypothesis through the rejection of the null hypothesis. He argues that this search for one more confirming case leads



to the lack of precision in the formulation of hypotheses. He discusses the advantages of research designs which place positive emphasis on attempts to reject more risky hypotheses specified in the non-null form.

Readers are challenged to debate ideas presented in the pages of this journal. In this issue we present a theoretical "kite" flown by Powell. He posits a definition of experience based on the interaction of two models, the environment and the primitive learner, and suggests some hypotheses which relate the interaction model to actual human and animal learning. Powell and others authors, such as LeFrancois (*A Theory of Behaviour [or As You Like It]*, June, 1967), hope that readers will be moved to write articles in response to their ideas. Critical discussion of ideas is necessary to their growth and refinement, even to their abandonment in favour of more fruitful approaches.

Chabassol and Thomas present the results of a correlational study of anxiety, aptitude, achievement and performance for female teachers. They suggest other studies that might be done on the basis of their findings. Dockrell and Brosseau demonstrate the need for researchers to do initial investigations with unique samples *as they are available* in order to make a beginning in important research areas. Their study suggests a need for investigation into the question of whether English-speaking children can become bilingual if taught exclusively in the second language even when there is no feedback from unilingual parents.

Friesen examines the "profile" of the potential dropout. His presentation of many variables and their relationships to the desire of a particular group of young people to stay in school may suggest possibilities for tightly controlled studies. The most promising relationships, with the variables well-defined, might be investigated.

Two studies of the achievement of transient students are included in this issue. Varying results may be related to the differences in research design, to the definition of crucial variables, or to genuine differences in the populations studied. Would Wickstrom have concluded, as did Sister Annata, that transiency has a greater effect on the achievement of girls than of boys had his analysis allowed consideration of that variable? Sister Annata's finding that the achievement of boys is not affected so much by the initial transfer as by increasing numbers of transfers seems to be supported by Wickstrom's general finding that moderately mobile pupils seem to fare as well as or better than non-transient pupils.

The final article is a timely note on tax concessions and their role in encouraging full use of our educational facilities by a greater proportion of eligible students. Salyzyn discusses, from the point of view of an economist, various schemes for the allocation of resources to education including the recommendation of the recent Royal Commission on Taxation.



*In this article the author discusses the implications of using the refutation of the null hypothesis as a basis for inferences in research. He supports the thesis that the rejection of an affirming hypothesis is the starting point of genuine research.*

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## A Note on Hypothesis Testing

A *statistical hypothesis* is a statement about a statistical population which on the basis of information obtained from observed data, one seeks to support or reject. A *statistical test* is a set of rules whereby a decision about the hypothesis is reached.<sup>1</sup>

This view may be satisfactory for the statistician, who is primarily interested in the mathematical and methodological aspects of hypothesis testing and the inferences that, on the bases of the data, can be drawn. Effective interpretation of research and adequate understanding of the implications inherent in research studies necessitate consideration of other issues. Explication of these involves: (1) description of the hypothesis forming process, (2) comment on the use of the null hypothesis for maintenance of scientific rigour in research, and, (3) explication of the implications inherent in the acceptance and rejection of hypotheses. Study of these issues leads to the conclusion that the end product of a statistical test of a hypothesis is not a decision about the hypothesis but a decision regarding the ontological status of the entities from which it was derived. Consequently, the testing of a hypothesis is an intermediate stage in systematic enquiry.

### I

Formulation of a hypothesis constitutes stipulating the *possibility* of confirming or refuting the existence of some relationship, state of affairs or entity within the experiential domain to which reference is directed. Understanding the logic of hypothesis formation necessitates explication of the structure of a *referent* domain and of the logical (i.e., relevant)



process by which hypotheses relevant for description or explanation of it are formed. An experiential domain consists of a set or series of observed, assumed or postulated states of affairs. Hypotheses are designed to test the evidence for the existence of these states of affairs. Hypothesis testing is then concerned with the central problem of induction—the problem of establishing and validating the relationship between the existent world and the language used to refer to it. The relationship between a statement about the world and the world is a factual question.

The domain to which a hypothesis directs attention may be conceived as being composed of several logical types of entities. The term 'entity' is used to refer to the total range of possible things and includes, among others, objects, ideas, relations, dispositions but for the purposes of this paper it is not necessary to distinguish these. Among the types of entities are *observables*, *generalizations from observables*, *abstractions from observables*, and *theoretical constructs* (concepts) introduced by the enquirer. This is an arbitrary and convenient taxonomy but not necessarily *the* taxonomy. To each entity in each category a word or name (label) is co-ordinated and these words make up the *vocabulary* of the domain.

*Observables* are simple, directly apprehendable entities which can be ostensively defined. Knowledge of their existence is dependent upon acceptance of a theory of perception that will establish the validity of sense-data as indicants of sensible entities, and, as well, on an explanation of the process of conceptualization which determines the sense-data that are observed. *Generalizations* are classes of observables and therefore are only one stage removed. Their ontological status is dependent upon the same criteria but to it must be added the problem of the "inductive leap" inherent in all inductive inferences. In other words knowledge of the existence of a class is dependent upon knowledge of the existence of the particulars that comprise it. The referents of generalizations cannot be observed as such and therefore no general term can be ostensively defined. *Abstractions* from observables are generalizations suggested by observation but consisting of more than summarizations of observations. In this type the entity formulated is conceptualized by noting and observing a series of entities with common or similar properties and *conjecturing* to another entity which attempts to explain the observations and the variations within and among them. These abstract generalizations have been called *conjectural generalizations*. This is the preferred name because 'abstract' and 'abstraction' have etymological associations which tend to introduce undesirable vagueness. The distinction between simple and conjectural generalizations is the distinction between the inductive leap and the conjectural or speculative leap. In the former the observed properties of a finite series of particulars are used to postulate that all



members of the class possess those properties. In the latter a series of observations of variable magnitude of a property are used to formulate a generalized statement regarding the magnitude of that property.

A domain which is assumed to include only observables and generalizations from observables (simple generalizations) is a simple enumerative descriptive domain and theories formulated within it, or derived from it, cannot have more than limited descriptive import. They are descriptive because they purport only to enumerate the kinds and quantities of things that are observable and limited because observability is curtailed by a pre-existent conceptual schema. Conjectural generalizations constitute the first stage or move beyond the purely descriptive. Domains which claim them among their constituting entities permit the formation of hypotheses (and hence theories) that guide the process of description toward awareness of the possibility of the existence of previously unobserved (and unobservable) entities. The introduction of conjecturally developed entities provides for the development of more powerful descriptive theories and paves the way for explanations. Consequently this is the domain of scientific discovery but it is a relatively low power form of discovery.

To increase the power of description and explanation it is necessary to postulate the existence of entities that are neither directly nor indirectly suggested by observation. These entities are *theoretical constructs* which are not derived from observation of the properties, similarities and variations in phenomena external to the enquirer. They are created by the enquirer and used as the premises of deductive arguments that lead to the implicit definition of possible entities. The enquirer who operates in a domain defined by entities of this type is concerned with discovery in a different sense from that applicable to those who start from observation. Concern is with inventing a theoretical system to direct and guide enquiry, not with formulating a theoretical system designed to describe or explain observations made. The end product is description (or explanation) uninhibited by the enquirer's previously established conceptual (and perceptual) frame.

These four classes of entities, observables, summary generalizations, conjectural generalizations, and theoretical constructs, constitute the totality of things that may be considered to be the possible elements of a referent domain. To facilitate reference the four classes are designated by the symbols  $E_o$ ,  $E_s$ ,  $E_c$  and  $E_t$ . The members of each class are in practice designated by words\* and the set of terms produced constitutes the vocabulary of the domain. These terms are frequently referred to as

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\*e.g. Score: 85 when used to refer to a particular score is the word used to designate an  $E_o$  entity. Its significance is determined by a co-ordinating definition which relates it to a state of affairs.



the *primitive* or *undefined* terms of the domain and of any descriptive or explanatory theory applicable to it. The link between the terms in the vocabulary and the entities to which they refer is made by co-ordinating definitions, which may be operational, stipulative or ostensive. The operational form lends itself most readily to empirical verification but limits the scope of the system because of dependence on observations.

The entities, the co-ordinating definitions and the terms of the vocabulary constitute the referent domain. Hypotheses about the domain use the primitive terms as their descriptive words and their function is to show possible ways of establishing that the entities to which these words refer are in fact existent entities. The function of enquiry is the establishment of evidence to support the assertions made when entities are named.

The process of hypothesis (and theory) formation necessitates the unification of primitive terms of the referent domain to constitute the defined terms of the logical domain. For example, if  $S$  designates the score of an individual for a specified test and  $\bar{S}$  the mean score for the class  $S'$  of which  $S$  is a member, then  $S/\bar{S}$  is a defined term within the system which gives a measure of the achievement of  $S$  relative to the class  $S'$ .  $S$  is an observable,  $\bar{S}$  a generalization from observables and hence the domain is an ' $E_o . E_s$ ' (logical conjunction) domain. The number of primitive terms related to constitute a defined term and the form of the relation is an arbitrary but logical process, i.e., two or more primitive terms are related by logical connectives to produce a defined term. The number of defined terms that can be formed is dependent only upon the total number of possible combinations of the primitive terms. This means that the move from primitive terms to defined terms is a move from possible experiential states in the referent domain to inferred entities in a theoretical domain. It is in this theoretical (logical) domain that hypotheses are formulated. The only intervening step between defined terms and hypotheses is a set of axioms logically derived from the defined terms.

The move to defined terms renders the context in which hypotheses are formulated factually independent of the domain to which they refer. Consequently the acceptance or rejection of a hypothesis is *per se* factually meaningless because hypotheses are about defined terms and axioms.

## II

Scientific rigour demands that confirming evidence should count if and only if it is the result of a genuine test.<sup>2</sup> In view of the human propensity to see or read into any situation those aspects which are expected, a genuine test is one designed to disconfirm or refute the belief or theory held. Unless this condition is accepted and applied the researcher is likely to disregard or fail to notice instances that are contrary to the



theory. Even if this gross error is meticulously avoided the best that can be achieved is the discovery of one more confirming case.

The tendency to concentrate upon the discovery of confirming cases leads to the use of experimental designs and statistical procedures that maximize the probability of finding them. This can be, and frequently is, achieved by making the hypothesis less precise. For example, inability to make accurate predictions about individuals leads to relegation of prediction to groups or samples. This has occurred in prediction of academic success and it can be argued that, though the procedure is justifiable and intellectually honest for the counsellor, it may be disadvantageous for the progress of research. Prediction as a counselling or administrative device must be separated from prediction as an adjunct to explanation. A strong case for emphasis upon research studies based on specific predictions for individuals as a means of refining measuring techniques can be made but the argument is not within the scope of this paper.

Present concern is with the null hypothesis and some aspects of its use as a methodological procedure. The final stage of an experiment is the acceptance or rejection of the hypothesis. If a hypothesis is accepted the researcher incurs the possibility of false acceptance—the possibility of accepting a hypothesis which should in fact be rejected. This the statistician calls Type II error. If, on the other hand, the hypothesis is rejected a Type I error is made if, in fact, it should have been accepted. Scientific caution leads to a preference for the latter type partly because it is less disadvantageous to reject falsely than to accept falsely and partly because the latter type of error (more precisely the probability of making it) is wholly under the control of the experimenter. These factors cause the statistician to concentrate upon efforts to reject rather than to accept. This procedure appears to conform to the criterion of refutability but it may be *only* appearance.

Hypotheses are set up on the basis of a prior belief (particularly if they are derived from  $E_o$ ,  $E_s$ , or  $E_c$  terms) that the treatment being tested will have the effect hypothesized. The researcher believes that the experiment will reveal that  $\bar{X}_e \neq \bar{X}_c$  (test in terms of means: 'e' and 'c' denote experimental and control groups respectively). Application of the null hypothesis technique necessitates the specification of the opposite view and therefore the hypothesis  $\bar{X}_e = \bar{X}_c$  is tested. If the experiment is successful in terms of the principle of emphasis upon rejection this hypothesis will be rejected. Rejection leads to the *acceptance* of the alternate hypothesis  $\bar{X}_e \neq \bar{X}_c$  (or a more precise form of it such as  $\bar{X}_e > \bar{X}_c$ ). But, as this is the hypothesis which was initially believed to be true the whole process becomes one of emphasis upon the discovery of confirming evidence. This means that the hypothesis



testing procedure while appearing to be an application of the stringent refutation criterion is in fact a confirming procedure.

This does not deny the validity of the null hypothesis technique as a statistical method but it does render it less acceptable on epistemological grounds than is usually believed. If, as Karl Popper asserts, confirming evidence should count only when it is the result of a genuine attempt to refute, then the hypothesis that is tested must be the hypothesis that is believed by the enquirer. To do otherwise is to make the whole process self-defeating.

This aspect is, however, the lesser part of the problem. The more important aspect is the question of what in fact we do reject when we reject a hypothesis. Consideration of this is simplified by disregarding null hypothesis techniques. The question posed can be expressed precisely in the form "What does it mean to reject the hypothesis  $\mu_1 = \mu_2$ ?"

### III

The conduct of systematic enquiry may, for the purposes of description, be considered to involve three stages or domains. These are (1) the *referent*, (2) the *logical* or *theoretical* and, (3) the *verifying* domains which, for ease of reference, may be designated by the symbols  $D_r$ ,  $D_l$ , and  $D_v$ .

In  $D_r$  the area or field to which the research is applicable is specified and delineated and the entities (properties, relations, states of affairs, dispositions, etc.) which are, or may be, its constituents are nominated. These nominations are made with the primitive terms previously mentioned and described. Systematic enquiry is designed to establish the existence of these entities or, more accurately, to increase the probability that statements asserting or implying their existence are warranted by the evidence. Within  $D_r$  the connection between the primitive terms and the entities nominated by them is arbitrary or, at best, conventional.

Valid and reliable measurement of any magnitude (if entities exist they must have magnitude in some form and some degree) requires that the measuring instruments be factually independent of the entities being measured. Achievement of this condition necessitates the translation of the primitive terms in  $D_r$  to defined terms in  $D_l$ . The number of defined terms that can be constructed is dependent only upon the number of permutations and combinations of the primitive terms in  $D_r$ .

In  $D_l$  the defined terms are combined according to logical rules to formulate axioms which in turn enable the formation of general hypotheses. As  $D_l$  is not factually dependent on  $D_r$  there exists neither psychological nor ontological necessity to make the axioms consistent with experience and hence the enquirer is unrestricted with respect to the



range of hypotheses that can be formulated. The only necessary condition is that hypotheses must be logically derived from the undefined terms. This means (1) that the axiomatic system constructed can restrict the  $D_r$  by definition and, (2) that hypotheses can be set up to specify possible states of affairs for which there may be no known empirical grounds. The result is the establishment of a conceptual frame free from prior beliefs. Of course, the degree of abstraction achieved depends upon whether the undefined terms are derived from primitive terms nominating  $E_o$ ,  $E_s$ ,  $E_c$  or  $E_t$  concepts.

The transition from the general hypotheses of the logical domain (e.g.,  $\mu_1 = \mu_2$ ) to empirical and testable hypotheses (e.g.,  $\bar{X}_1 = \bar{X}_2$ ) constitutes the transition to the verifying domain. The derivation of testable hypotheses is a deductive process. The problem of the validity of the relation between  $\mu_1$  and  $\bar{X}_1$  (and  $\mu_2$  and  $\bar{X}_2$ ) is in part statistical sampling theory and in part epistemological theory but need not be specifically considered here. It is sufficient to note that all statistical significance is related to the assumption that the statistics calculated are reliable estimates of the parameters they are assumed to estimate.

In summary it can be said that the enquiry system is composed of a *referent* domain maintaining or implying an ontologically significant relation to an existent state of affairs; a *theoretical* domain in which general hypotheses relevant to the referent domain are generated; and, a *verifying* domain in which empirical hypotheses are derived and tested. The connections among entities within each domain and the connections between domains are definitional and arbitrary—they may or may not be conventionally established.

In view of this the question of the meaning of the acceptance or rejection of a hypothesis in the verifying domain must be considered. If the generation of a hypothesis  $H_o : \bar{X}_1 = \bar{X}_2$  is the result of logical deduction (and definitional agreement) from a set of observed, hypothesized or postulated entities in the referent domain it necessarily follows that acceptance of a hypothesis constitutes acceptance of the existence of those entities, (i.e., ontological acceptance). Consequently acceptance (or rejection) of a hypothesis necessitates the acceptance (or rejection) of ontological assumptions inherent in the entities of the referent domain. Moreover, if a hypothesis is rejected it can be assumed that one of two possible states exists—there is either an error in the logic of the theoretical domain or there are ontologically unacceptable assumptions among the entities of the referent domain.

The conduct of enquiry is designed to lead to increases in the values of the probability statements about entities in the referent domain or to the discovery of previously undetected entities. These increases and/or discoveries can only result from tests based on genuinely risky



predictions. Increases in the riskiness of prediction cause increases in the probability of rejection (refutation) and consequently rigorous research necessarily implies positive emphasis upon attempts to reject hypotheses specified in the non-null hypothesis form. Although utilization of the null hypothesis may be statistically sound it is philosophically unsatisfactory unless its characteristics are clearly understood and its limitations realized.

Statisticians have always stressed the value of emphasis upon hypothesis rejection but they have done so for statistical reasons. These reasons are valid but empirically and practically less important than the ontological reasons. The weakness of the statistical procedure lies in the acceptance of the alternate hypothesis when the hypothesis tested is rejected. This places undue reliance upon the accumulation of confirming evidence. Of course, we want to confirm hypotheses but we must be careful to ensure that we do so if, and only if, confirmation is ontologically justifiable. The chances of doing this are maximized if we ensure that every experimental situation and every test are genuinely designed to refute a hypothesis or a theory. Rejection (or acceptance) of a statistical hypothesis does not constitute rejection of the hypothesis *per se* but rejection of either the logic of the process of hypothesis formation or of the entities from which the hypothesis was derived.

It follows that the rejection of an affirming hypothesis ( $H_0 : \bar{X}_1 = \bar{X}_2$ ) is the starting point of genuine research. The moves that follow are (1) the re-examination of the logic of  $D_1$  and (2) reconsideration of the evidence for the existence of the entities of  $D_r$ . That these moves are seldom made need not be stressed.

It also follows that failure to reject an affirming hypothesis can be scientifically useful only if it leads to re-examination of  $D_1$  and the formulation of a more precise hypothesis (more risky) that will increase the probability of rejection. The long run aim is, of course, the development of measuring techniques that will enable the testing of very precise hypotheses that cannot be rejected. For these reasons it may be that emphasis upon prediction for groups on the basis of statistical probability will have to give way to emphasis upon prediction for individuals in very limited contexts. Enquiry is a piecemeal, little by little undertaking.

It has been said that "ontology is the core of philosophy"<sup>3</sup> because the pursuit of any problem to the limit always leads to decisions about the ontological status of the entities involved. It has also been stated that "philosophy lays the track on which research runs"<sup>4</sup> because the questions which research attempts to provide evidence to support or answer are philosophical questions and because the evidence itself must be subjected to the rigorous examination that is the function of philosophy. Philosophical and empirical enquiry are two arbitrarily distin-



guished and interdependent aspects of a single activity—the pursuit of knowledge.

Effective research needs to be preceded by rigorous analysis of the assumptions and postulates and succeeded by equally rigorous examination of the conclusions and inferences. The division between research and philosophy in the sense in which the terms are correctly used is both arbitrary and extremely difficult to draw. Perhaps it is more significant to note that the distinction between the researcher and the philosopher is equally difficult to distinguish. Indeed attempts to do so seem to be pointless because the terms ‘research’ and ‘philosophy’ refer to phases of the process of systematic enquiry and each is carried on alternately and/or simultaneously by the same individual(s).

#### REFERENCES

- <sup>1</sup> B. J. Winer, *Statistical Principles in Experimental Design*, (New York: McGraw-Hill Book Company Inc., 1962), p. 9.
- <sup>2</sup> See Karl R. Popper, *Conjectures and Refutations*, (London: Routledge and Kegan Paul, 1963).
- <sup>3</sup> G. Bergmann, *Logic and Reality*, (Madison: The University of Wisconsin Press, 1964).
- <sup>4</sup> K. J. Shannon, “Philosophy and Research”, *California Journal of Educational Research*, Vol. XII, No. 4, September, 1961, p. 146, (Editorial).







*Experience is defined in terms of the interaction between two models, an "environment" model and a "primitive learner" model. The latter is so constructed to be a legitimate element of the former and so as to have some interesting implications for human and animal performance which it purports to simulate.*

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## A Definition of Experience Based on a Primitive Learning Model

### *Introduction*

The term "experience" has a broad range of definitions. It is used not only to refer to the specific events through which a person passes but to the accumulated recollections of these events, to the length of time devoted to a specific subset of these specific events, to mention only some of the possible meanings. Thus, we find that the term encompasses many of the central problems in epistemology.

To avoid confusion we will use a somewhat restricted definition for experience in this paper. The *Shorter Oxford Dictionary* defines experience as "the observation of facts or events, considered as a source of knowledge." It will be noted that this definition contains three elements: an "observer", an "environment" composed of "facts or events", and the "interaction" between these two primary elements to produce the secondary element "knowledge."

In order to elaborate this definition into a functional statement of epistemological problems, it is necessary to generate two models: (1) an "environment" model and (2) a "primitive learner" model, which must, of course, be one of the elements of the "environment" model. If these two models are allowed to interact, the result represents "knowledge." We can then consider the whole process to be a functional definition of experience.



### The "Environment" Model

The constituents of an *environment* are not always directly quantifiable and, since they are not necessarily ordered, neither a matrix nor a lattice is exactly appropriate for our definition. In our effort to define an *environment*, we will, therefore, generate a lattice-like structure which we will call a "state of affairs" and then show that, by combining these "states of affairs" in certain ways, an *environment* can be generated.

#### Fundamental Constituents

Analagous to the mathematical concept of point, we will assume a particular quality which we will call an *attribute* ( $a, b, \dots$ ). This attribute will be considered such that it is drawn from a universe set of attributes. Attributes have the following characteristics:

1. *Distinguishability* ( $\hat{d}$ )\*—each attribute may be in some way distinguishable from at least some other members of the universe set from which it is drawn.
2. *Equivalence* ( $\equiv$ )—each attribute may be in some way indistinguishable from at least some other members of the universe set from which it is drawn.
3. *Comparability* ( $\hat{c}$ )—in order to be able to distinguish one attribute from another some form of comparison between attributes must be made.

Thus, for the  $i$ th and the  $j$ th attribute the following relationships hold.

$$(a_i \hat{d} a_j) \vee (a_i \equiv a_j) \text{ but not } (a_i \hat{d} a_j) \cdot (a_i \equiv a_j)^{**}$$

i.e., attributes may or may not be distinguishable from each other but two attributes are not both distinguishable and indistinguishable from each other.

This relationship implies a number of others, for instance:

If  $a_i \hat{c} a_j \equiv a_i \hat{c} a_k$   
 then  $a_j \equiv a_k$   
 etc.

4. *Scalability* ( $\hat{s}$ ) —at least some attributes are scalable in the sense that if the comparisons between pairs of unlike attributes are in some way equivalent, then all the attributes with this property are members of the same scale.

If  $a_i \hat{d} a_j \hat{d} a_k \hat{d} a_l$   
 but  $a_i \hat{c} a_j \equiv a_k \hat{c} a_l$   
 then there is a scale  $S_m$  such that  
 $S_m \subset a_{mi}, a_{mj}, a_{mk}, a_{ml}$

---

\*The symbols used in this paper for characteristics or operations are included in parentheses following the name of the operation.

\*\*The following symbols from logic are used throughout this paper:

(.)—and, ( $\vee$ )—or, and ( $\subset$ )—the inclusion set



### Fundamental Components

A component (C) is a set of attributes. It has one important characteristic not present in the attributes themselves. The characteristic is:

1. *Uniqueness (U)*—a component is a component if and only if the set of attributes which constitutes the component is at least in some way different from all other constituent sets. These differences may be slight or large, involving one attribute or more.

$$\text{i.e., } (C_{a_1, \dots, a_m}) \hat{d} (C_{a_1, \dots, a_n}) \text{ where } m \neq n$$

$$\text{or } (C_{a_1, \dots, a_n}) \hat{d} (C_{b_1, \dots, b_n}) \text{ where } a \text{ and } b \text{ are attributes.}$$

### A State of Affairs

A “state of affairs” is a set of components. Hence, the universe of all states of affairs is the set of all possible components.

There are several possible kinds of components. We will confine ourselves for the purpose of this discussion to three, namely the object components, the event components, and the condition components.

1. *Object components ( $\alpha$ )*—an object component is part of the subset of the universe state of affairs which is *physically identifiable* at any given time  $t_0$ . The universe of object components is the object state of affairs (A).
2. *Event components ( $\beta$ )*—an event component is a component which is identifiable as representing some possible transformation of an object component over a time interval  $t_2-t_1$ . The universe is (B).

*Replacement ( $\leftarrow$ )*—the transformation which occurs to form an event component is of one kind only. Some subset of the attributes of an object component is replaced by a new subset such that the uniqueness principle continues to apply. This replacement may not occur in some cases, i.e., the null transformation.

$$\text{i.e., } \beta_c \equiv C_{a_i} \leftarrow C_{b_j}$$

where  $i$  may or may not equal  $j$   
except for the null transformation.

It should be noted that the maintenance of the uniqueness principle makes the event state of affairs also a subset of the universe of components. A further restriction occurs because of the uniqueness of each object which excludes from each object some of the possible events; hence, the set of all possible events which could occur to a particular object over any particular time interval  $t_2-t_1$  is a subset of the universe of event states of affairs.

3. *Condition components ( $\gamma$ )*—it will be assumed that a replacement event will occur if and only if a particular set of conditions relative

to the particular attribute of the particular object component are met. The condition universe is  $(\Gamma)$ .

It should be noted that although these three states of affairs each are composed of components, each state of affairs is unique from the others. That is, there are no components  $C_\alpha$ ,  $C_\beta$  or  $C_\gamma$  such that:

$$(C_{\alpha_i} \equiv C_{\beta_j}) \vee (C_{\alpha_i} \equiv C_{\gamma_k}) \vee \dots$$

### Environment (E)

An environment will be defined as a lattice-like structure composed of *elements*. The elements of any environment have the following characteristic:

*An Element (e)*—is the intersection of two or more components each of which must be drawn from a different state of affairs.

Figure One illustrates this relationship.

### VENN DIAGRAM ILLUSTRATING THE GENERATION OF AN ELEMENT

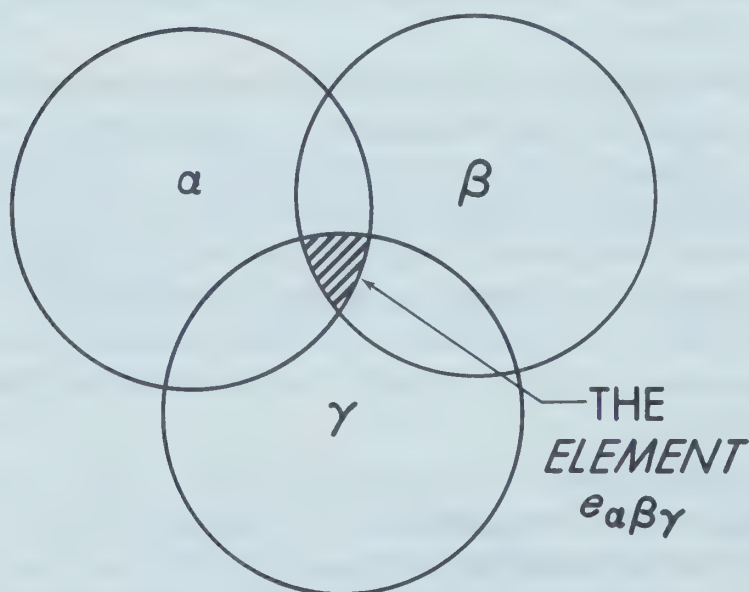


FIGURE 1

Thus the Environment  $E_{\alpha\beta}$  represents the total possible environment in infinite time, whereas the Environment  $E_{\alpha\beta\gamma}$  represents any possible finite environment over any finite time.

Since the definition of the various components is constant, changes in the environment  $E_{\alpha\beta\gamma}$  are equivalent to corresponding changes in the



attribute constituents of the elements  $e_1, \dots, e_n$  such that:

$$E_{\alpha\beta\gamma} \subset \{e_1, \dots, e_n\}$$

Any total observable environment is equivalent to the intersection of its constituent object, event and condition states of affairs.

$$E \equiv AB\Gamma$$

It should also be noted that of the three states of affairs only A is physically identifiable at any time  $t_0$ , hence, although B and  $\Gamma$  are present, their presence and nature can only be inferred by observing transformations of A over the time  $t_2-t_1$ .

### Causation ( $\rightarrow$ )

One of the characteristics of the conditional state of affairs is that changes which can occur in an element are of two classes, *Output*, in which some change in the attribute constituents of element  $e_i$  occur as a result of undefined internal changes in  $e_i$ , and *Input*, in which changes in  $e_i$  are at least partially attributable to changes in at least one other element.

#### 1. Simple Causation

Simple causation would then be definable as output from one element leading directly to input in another. Thus:

$$\Delta e_i \rightarrow \Delta e_j \text{ where } \Delta \text{ means "change."}$$

#### 2. Process

Multiple causation or *process* can be defined as:

$$\Delta \{e_i \dots e_m\} \rightarrow \Delta \{e_j \dots e_n\}$$

#### 3. Feedback and chains

This idea of multiple causation and multiple effect suggests several other possibilities. For instance, in certain circumstances, input into a set of elements may change the conditional relations within this set in such a way as to bring about output from this second set. The new output can go in either or both of two directions, toward the original output, in which case we have *feedback*, or toward a third set of elements, in which case we have a *chain reaction*.

#### 4. Cycling, growth and decay processes

There are other possibilities which should be considered. Combinations of feedback and chaining can lead to *cycles*. This effect can be produced either by feedback or by a closed chain.

*Growth* and *decay* processes are inverses of each other. If the output of an element or group of elements is such that, relative to the conditions in force, the resulting changes lead to an *increase* in the volume of output, this is a growth process. The converse is a decay process.

### 5. *Equilibrium states*

If the growth and decay processes balance each other or if a stable cycle is established, an *equilibrium* state occurs. If growth or decay within or outside of a cycle are very slow, then a *quasi* equilibrium state results. It is necessary therefore to distinguish between short and long run equilibria.

### *Summary*

We have defined an *environment* as a unique set of unique elements. Those *elements* are, in their turn, the intersection of at least two *components*, each drawn from a distinct *state of affairs*. Components are made up of unique sets of *attributes*. In order for *states of affairs* to be distinct when drawn from the universe of components, sets of restrictions involving the nature of the attributes contained in the components are established.

Finally *attributes* are defined as distinguishable members of an undefined universe. This definition reduces the system to the point and point set basis characteristic of a mathematical system. Attributes have a number of properties other than distinguishability, most notably *equivalence* and *scalability*.

The fact that conditional statements can be part of environmental elements makes the application of N value logic possible in this system. Also a number of possible *processes* are suggested. It is not, however, our intention to explore exhaustively at this time the mathematical properties of an environment as defined. The model has been developed for a specific applied purpose, that of defining experience. Its properties are sufficiently like those of our natural physical environment for our present purpose.

### *The Primitive Learner*

As already stated our primitive learner must be an element in the environment. We will need to select from this environment an element capable of both input and output, and of all three processes—cyclic, growth and decay.

In order for this element to be capable of all three of these processes, it must be capable of internal modification of input and the initiation and direction of output, as well as being a self-sustaining system. It is to the possible characteristics of such an element that we now turn our attention. It is this element which we will designate as a *primitive learner*.

All self-sustaining systems have these three characteristics and their related subfunctions:

#### A. *Input:*

1. selection
2. decoding



B. *Information analyzing\**

1. recognition
2. orientation
3. recall
4. specification of error tolerance
5. analyzing strategies
6. arousal
7. data capacity

C. *Output:*

1. selection
2. encoding
3. feedback

We will discuss each of these in turn and specify a model of a primitive learner which meets these requirements.

A. *Input:*

Since the elements of the environment are composed of distinguishable attributes, there is a need for some sort of input mechanism which has the capability of recognizing these differences.

Mechanical and electromagnetic transmissions from elements either by reflection or in the form of direct output are the most easily distinguishable by possible mechanical, electrical, or electro-chemical sensing devices. Even when confined to this sort of attribute, the possible amount of information is very large. It is usual for sensing devices to be further restricted to particular critical transmission types. Sensing devices select from the possible range of input particular critical forms of input, critical in the sense that they are critical to the function of the system. This characteristic of *selection* has two important functions; first, it removes a considerable amount of redundancy from the input and second, it reduces the amount of input which the system is required to analyze.

Self-sustaining systems have the problem of functioning within the restrictions of *real time*, hence data reduction is of primary importance.

This selection process operates in two dimensions, (1) the *nature* of the input to which the sensor is selective and (2) the *range* of sensitivity. Range refers to the two input qualities of frequency and intensity.

In addition, input arrives at the sensors in a number of different modes. Since it is unlikely that the system can analyze all of these modes, it becomes necessary to translate or *decode* at least some of these modes into a form more suitable for analysis within the system. This decoding involves, in effect, the translation of all input modes into a single system-

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\*We are using the term *analysis* in the place of the more usual term *process* in conjunction with the term information in order to avoid confusion with our earlier use of the term *process*.

amenable code. In this latter case there is no need for there to be any similarity between the systematic code and the sensory input mode it designates so long as the equivalence is recognizable by the system. It is from this latter fact, as we shall see in more detail later, that a symbol system can be derived.

### B. Information Analyzing

1. *Percepts*: As has already been indicated, it is necessary for the system to recognize the sensory input in order to be able to analyze it. In self-sustaining systems this recognition is accomplished in several different ways. To begin with, certain types of input are usually *flagged*, that is, they carry a distinctive marking in order to identify their nature. These flags are analagous to the positive or negative signs used in mathematics to signal directed numbers. These flags are built into the code. A second way of flagging a signal is to include in it an override signal which is looked for by the analyzing strategies. In computer terminology, these signals usually lead to a branching point in the programme.

A third way to flag a signal is to compare it with information already stored in memory. In order to do this, there must be access to some form of memory in order to store information, either temporarily or permanently, and some way of calling for this stored information so that the comparison can be effected.

The first method of flagging an input signal in our primitive learner will be called *recognition*; the second will be regarded as *orientation*. The override characteristic of the "orientation reflex" will be discussed later with reference to the development of goals. Finally, the comparison with memory will be called *recall*. It is usual for perception theorists to combine these three systematic characteristics into one process, the process of *percept* formation.

2. *Concepts*: We have a second process in the analysis of information, that of *concept* formation. We shall treat this topic under four headings.

The first is the *specification of error tolerance*. There are two aspects of this tolerance, one which is innate, the other which is learned. Since the input process involves a substantial reduction in data quantity, it also introduces some error. If this error is critical, some form of compensatory strategies must be developed. On the other hand, the restrictions imposed on the system by functioning within the confines of real time make extensive elaboration unrealistic if not impossible. In short, the system must know when to desist. Hence the error tolerance in any given situation must be specified, either by external criteria as part of input, or by internal criteria as part of some goal definition. The override function of orientation provides for the external definition. In such cases, however, the criteria established on the basis of internal goals may



remain unsatisfied. We will discuss later the possibility that conflict between input and analysis demands on the system may be an important aspect of learning. Another importance of error tolerance will be discussed later.

If information is to be analyzed, there must be some *method of analysis*. Piaget\* suggests that there are sixteen categorical relationships and four closed transformations of these sixteen at the basis of the formal logic ability of adults. This particular aspect of our primitive learner will be developed in more detail in a subsequent paper. At present it is sufficient to say that this *groupement* as he calls it has most of the characteristics of a mathematical group, particularly, the operations of converse, reciprocal, negation and identity. In order to develop these operations and the related categorical relationships, there must be a necessary and sufficient minimum set of primitive strategies from which all of the others can be derived.

Although the full mathematical properties of the minimum set put forward here have not been explored it will be suggested that three strategies form this necessary and sufficient set. These three strategies will be designated as (1) inclusion, (2) exclusion and (3) coupling.

1. *Inclusion* ( $\varepsilon$ )—this strategy in its primitive form will be essentially perceptual, involving the flagging of information as similar to or identical to previously stored information.
2. *Exclusion* ( $\tilde{\varepsilon}$ )—this strategy is the inverse of inclusion.
3. *Coupling* ( $\int$ )—this strategy in its primitive form ties together two or more primitive strategies into a generated strategy.

It should be noted that inclusion ( $\varepsilon$ ) and the formation of the inclusion set ( $\subset$ ) in logic are not identical operations. By the inclusion operation we mean that two elements are considered equivalent if a reasonable subset (by reasonable we mean within the specified limits of error tolerance) of the attribute constituents of one element are equivalent to a corresponding subset of the other.

In order to indicate the difference between inclusion ( $\varepsilon$ ) and set membership ( $\subset$ ) we need a new operation. This operation is the *Definition* (*Df*) strategy and refers specifically to the chain of primitive operations which form the strategy. Hence, for a set  $p$ , defined by the inclusion ( $\varepsilon$ ), two or more elements make up this set if any subset of the attributes of these elements is equivalent for all the elements in question. Symbolically: If  $\{a_i, \dots a_m \mid e_k\} \equiv \{a_j, \dots a_n \mid e_l\} \equiv \dots$

Then  $p$  *Df*  $\varepsilon$  for the elements  $e_k, e_l, \dots$

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\*The specific calculus for this *groupement* as he calls it are found in his *Logic and Psychology*, New York, Basic Books, 1958.

It must be recognized that such categorical representations must, of necessity, be spurious. In fact,  $e_k \hat{d} e_l$  since by definition the total set of attributes of  $e_k$  and of  $e_l$  are not equivalent because of the uniqueness restriction.

Furthermore in order to establish a logical class, it is necessary to establish class limits. That is, the non-examples of the same class must also be defined. Hence, to define any particular class  $p$  we must couple an inclusion to an exclusion. Thus:  $p \text{ Df } \varepsilon \tilde{f} \tilde{\varepsilon}$

These strategies should be regarded as analagous to a computer program through which any appropriate information can flow to give conformable though not equivalent results.

We can readily see that these three strategies considered in this manner, forming into various kinds of processes, can be expected, not only to generate categories, but also because of the presence of a positive, an inverse and a uniting strategy, may be able to generate all the possible categorical relationships and the possible transformations on these relationships.

If a set of primitive strategies such as this are present in the actual psychological functioning of the human infant, their very presence and nature would explain the lawful sequence which characterizes Piaget's *genetic epistemology* since higher order strategies would have to be generated before certain types of analyses become possible.

The third of our topics in this section is *arousal*. If a self-sustaining system has only one analysis channel, then input and output velocities effectively determine the analysis velocity. System overloads occur only at input and output points. However, our primitive learner, although selective, is sensitive to multimodal input. In this case if the number of input and output channels exceeds the number of analysis channels, with each addition of an input or an output channel, the possibility of a system overload at points within the system other than at input and output points expands exponentially. This problem is further complicated by variable input and output demands and the restrictions of operating within real time. Of course the system can overcome some of the problem by modifying the specifications for error tolerance. To optimize analysis capacity however, there must also be some mechanism to modify the analysis procedure to meet the varying demands of input and output. This mechanism we will call *arousal*. It will be assumed to consist of a limited set of deployment and diversionary strategies which are innate, plus a whole set of learned strategies which set priorities and modify error tolerance specifications.

Finally in spite of the efficacy of arousal to optimize the data analysis of the system, it is still necessary to postulate the possibility of data



overload in any finite system. This possibility implies an absolute maximum of data volume for efficient analysis. Beyond this point analysis would be expected, under the influence of the data pile-up which would occur by the over-application of the arousal strategies, to become progressively less efficient. The inverted "U" shape of the arousal curve found in humans may well be analogous to the process just described. In fact, it may be possible to generalize this model even further by suggesting that the essential difference between the learning capacity of various organisms may be some relationship between the number of input and output channels usable, the number of analysis channels available and the degree to which data can be effectively simplified before it is analyzed or after analysis in calling for output. We will call this optimal system level the system's *data capacity*.\*

C. *Output*: Having once analyzed the data some form of output may be called for. This process involves the *selection* of appropriate output, the *encoding* of the output into some form of action signals which can be translated meaningfully by some form of output mechanism and some type of feedback to ensure that output has been satisfactorily executed.

This feedback also provides information to input which can, in a self-sustaining system, lead to continuance, modifications, termination, or override signals to the output mechanism. Override signals are particularly important in such diverse activities as social contacts and the sport of karate.

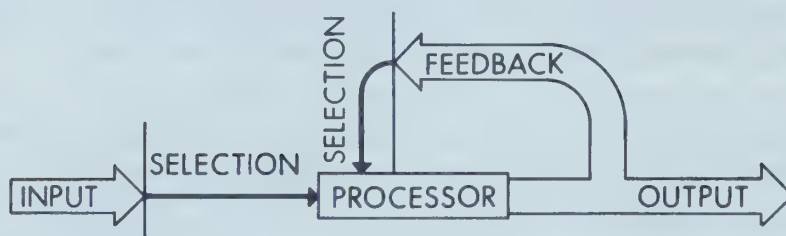
### *Summary*

We have devised, in this section, an element of the environment which can receive input, generate output and so modify its behaviour through feedback with the aid of innate and generated strategies that it can produce, within the limits of its data capacity, any or all of the processes characteristic of the environment. In so doing, again within its data capacity and its functional life expectancy, it may be regarded as a self-sustaining system. To be self-sustaining means that it must be able to modify its behaviour to meet the needs of internal and external changes. In other words, it must be able to learn. Since we claim that we have proposed a model with the minimum essential requirements to meet the demands of real time imposed by our environment model, we argue that we have generated in this section a *primitive learner*. This model is primitive in the sense that a simpler model would not be self-sustaining in the hypothetical environment proposed. Diagrammatically the model looks like this:

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\*Miller suggests that this capacity in humans is "Seven plus or minus two."<sup>1</sup>

THE PRIMITIVE LEARNER AS A PROCESSOR



*Learner—Environment Interaction*

As we have already seen, our primitive learner selects a subset of the data available for analysis purposes. Since these subsets can be equivalent even when the sets from which they are drawn are unique, the generation of classifications becomes possible. Storing these simplified classifications in memory makes them available for recall. It is from this process of classification and storage that a symbol system emerges.

Of what, we may ask does this symbol system consist? Taking into account the interaction of orientation, arousal, data capacity and error tolerance specifications, we can imagine a system with little or no memory having a very limited selection zone. As objects from the environment become organized into simple inclusion and exclusion classes, certain kinds of transformations of these classes which are related to immediate need-goals will be identified. These will become linked with growing output facility to produce rather complex object—event—action complexes which once in memory serve to flag current input.

It is assumed that some of the most primitive output needs are established as innate reflexes and these reflexes will be assumed to be a substitute for learning. Thus we would expect that the higher the innate data capacity the more primitive and the fewer the reflexes.

Our original symbols then are object—event—action symbols which we will call *eidetic*\* symbols (because of their connection with eidetic imagery) and will suggest that they are idiosyncratic to each unique system. Furthermore these symbols will be experience and perception bound.

The linking of object and event with action (output) can easily be equated with the primitive development of goals. It is probable that as goal oriented behaviour becomes more highly organized the orientation reflex becomes less important. It is also probable that the function of this reflex changes, leading eventually to such phenomena as the “circular reactions” which Piaget contends are the origins of intelligence.

\*Bruner subdivides this symbol system into two representational systems, namely *enactive* and *iconic*.<sup>2</sup>



At a later stage, if the system has the capacity for this level of sophistication, formal (conventional) symbols can be substituted for eidetic symbols.

It should be noted that at any time  $t_0$  only objects are contained in input and events and conditions must be inferred from object transformations over short or long time intervals. Hence, objects become the major content of the first symbol systems. Event and condition symbols except in so far as these are related to immediate need-goals will have to await the mastering of output before they can be explored.

Thus, we would expect a gradual differentiation of symbol systems from the global eidetic ( $e'$ ) to particular eidetic ( $\alpha', \beta', \gamma'$ ) to global formal ( $e''$ ) and so on. As the learner develops the ability to separate object, event and condition states of affairs from the elements in his environment, his ability to predict outcomes improves. The increase in classification ability and its concomitant improvement in prediction leads directly to a simplification of the data being analyzed. As the data are simplified, the effect is a functional increase in the data capacity, which means that the input volume can be increased by broadening the focus zone and by increasing the precision possible in the specification of error tolerance.

Piaget<sup>3</sup> divides this adaptive process into two subprocesses, assimilation and accommodation, which he describes symbolically as follows: (using our symbolism)

#### ASSIMILATION

$$a_1 \int e_1' \rightarrow \tilde{a}_2$$

$$a_2 \int e_2' \rightarrow a_3$$

$$a_3 \int e_3' \rightarrow a_1 \dots \text{where } a_1, a_2, \dots \text{ are internal states}$$

We will notice that a percept of an element (or an element set) from the environment is coupled with some internal strategy leading to some form of cycle. This can but need not involve output. The learner uses his present repertoire of strategies and categories to restore the equilibrium state.

#### ACCOMMODATION

$$a_1 \int \tilde{e}_1' \rightarrow \tilde{a}_2$$

$$\tilde{a}_2 \int e_2' \rightarrow a_3$$

$$a_3 \int e_3' \rightarrow a_1 \dots$$

In this case a "new" percept ( $a_1 \int \tilde{e}_1'$ ) is identified by the learner. This occurrence generates a new strategy or classification ( $\tilde{a}_2$ ), which, if successful, restores the cycle to equilibrium; again output is possible but unnecessary. In both cases the restoration of equilibrium is the reinforcing agent to learning.

Of course, this whole process is greatly facilitated by the introduction of formal symbols. As this process progresses, the learner's ability to cope with the ultimate uniqueness of each element in his environment steadily increases. At all stages, of course, there is an element of error in his deliberations, but this error is steadily reduced.

### *Outlook and Summary*

We have proposed a model for an environment and a model for a primitive learner, which latter is an element in the former. We have then allowed these models to interact so that we can now define *experience* as "the interaction between the learner and his environment."

Exactly what this definition means in terms of these models with respect to developmental sequence, error types at various stages, rates of learning, and comparisons of potential learning by varying the specifications of such parameters as arousal level, data capacity and error tolerance await a full scale simulation of the model complex. Also the similarities between this model complex and actual human and animal learning await the testing of hypotheses which can be generated from the model.

A few of these hypotheses follow:

A. Individuals with equal data capacity and equal arousal level will learn equal amounts in the same time interval. However, the quality of the learning may differ with the present strategy and category level of the individual; hence a low-performing student in school may learn as much as a high-performing student. The difference between their performances may lie in the fact that the low performer's strategies and categories are inadequate and/or inappropriate to the tasks set, which means that what he learns is confusion.

B. There will be qualitative as well as quantitative differences between the kinds of learning at different levels of development and among different species. This difference will depend on:

1. The set of innate reflexes
2. The data capacity of the individual
3. The stage of the individual's development.

These qualitative differences will be most evident in the characteristic kinds of error made.

C. Humans are capable of any level of abstraction at any level of development, provided:

1. The problem can be translated into the category and strategy systems currently operative in that individual.
2. That the discriminations required can be made sufficiently gross that they exceed the current error tolerance specification.



3. That the problem be decomposed into steps sufficiently small that the data analysis required does not exceed the data capacity of the individual.
4. That the solution of the problem can be related in some way to the current need-goal structure of the individual.

This last hypothesis spells out the conditions for learning which can be derived from the model. The implications of this last hypothesis for such technologies as programmed instruction are obvious. There are also corollaries to each of these which state that the reduction of the problem need not go any further than these four specifications; going further introduces redundancy.

Further exploration and refinement of this model complex is in progress. An immediate follow-up analyzing Piaget's system in more detail against the complex is being undertaken. The implications of this model to the physiological and biochemical function of the nervous system could be explored. Also the relationship between this model and the work of theorists other than Piaget could be fruitful. Finally, there is the possibility of the exploration and generalization of the mathematical aspects of this model complex which could prove very interesting as well. In any case, we feel that these ideas are worthy of further development.

#### REFERENCES

- <sup>1</sup> George A. Miller, "The Magical Number Seven, Plus or Minus Two. Some Limits on Our Capacity for Processing Information", *Psychological Review*, 1956, 63, pp. 81-97.
- <sup>2</sup> Jerome S. Bruner, Rose R. Oliver, and Patricia M. Greenfield, *et al. Studies in Cognitive Growth*, (New York: J. Wiley and Sons, 1966).
- <sup>3</sup> J. Piaget, *The Origins of Intelligence in the Child*, (New York: W. W. Norton and Co. Ltd., 1965), pp. 5-6.





*A study of the intercorrelations obtained for scores in anxiety, academic aptitude, academic achievement and teaching performance for 124 female education students. It was concluded that anxiety, as measured here, bore no relationship to either academic aptitude or teaching performance.*

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## Anxiety, Aptitude, Achievement and Performance in Female Teachers

Of the many non-intellectual factors which have been investigated in recent years in order to determine the influence they exert on behaviour and performance, probably none has been more frequently scrutinized than anxiety. Often the studies are similar to that of Grooms and Endler<sup>1</sup> in which the effect of anxiety on academic achievement alone is investigated. Other researchers, such as Endler and Snyder<sup>2</sup> introduce another variable, academic aptitude, in addition to anxiety and academic achievement. A third emphasis has been the study of anxiety and its influence upon ability to learn and to perform tasks, as exemplified by the fairly early work of Mandler and Sarason.<sup>3</sup> The present study was concerned with determining the relationship between manifest anxiety and all of the variables mentioned above, viz., academic aptitude, academic achievement, and ability to perform in a given area.

### *Method*

The Taylor *Manifest Anxiety Scale*<sup>4</sup> (MAS) was used as a measure of anxiety. The *School and College Ability Test* (SCAT) was accepted as a measure of academic aptitude, and final grade point averages served as indicators of academic achievement. The subjects utilized were student teachers and all of the above variables were correlated with success in practice teaching.

Involved in the study were 124 second-year females enrolled in the Faculty of Education, University of Victoria. These students had completed one year of arts and science courses. The second year is the professional year for such students and, with the exception of a second year English course, all work is taken in the Faculty of Education. These professional-year students teach for approximately eight weeks, and a final practice teaching grade (FPTG), which reflects the evaluations of from eight to twelve critic teachers and faculty members, is calculated at the end of the term for each student. Grade point averages (GPA) are also calculated at the conclusion of the April examinations. It should be noted that in the Faculty of Education at the University of Victoria the final grade point average of the student in his professional year includes the final mark made in practice teaching. The latter mark contributes 33 1/3 per cent of the former, so that an artificially high correlation might be expected between these two scores.

The *Manifest Anxiety Scale* was administered to the students during the second term of the professional year. The items were arranged in three groups in the manner suggested by Hoyt and Magoon.<sup>5</sup> Those items which Hoyt and Magoon found to be most closely correlated with clinical assessments of anxiety yielded the MAS<sub>1</sub> score. The items which were next in ability to so predict anxiety yielded the MAS<sub>2</sub> score. The items poorest in this respect yielded the score MAS<sub>3</sub>. Also calculated was a total score, MAS<sub>t</sub>, which combined the three subtest scores described above. The fifty MAS items were interspersed with an additional one hundred items, similar in content, but not designed to measure anxiety, in order to mask the true nature of the MAS. All students had taken the SCAT on being admitted to the university the previous year, and three scores, verbal (SCAT<sub>v</sub>), quantitative (SCAT<sub>q</sub>), and total (SCAT<sub>t</sub>), were available.

TABLE I  
CORRELATIONS BETWEEN MAS, SCAT, GPA, AND FPTG SCORES

|                   | MAS <sub>1</sub> | MAS <sub>2</sub> | MAS <sub>3</sub> | MAS <sub>t</sub> | SCAT <sub>v</sub> | SCAT <sub>q</sub> | SCAT <sub>t</sub> | GPA   | FPTG   |
|-------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|-------------------|-------|--------|
| MAS <sub>1</sub>  | .....            | .74*             | .55*             | .90*             | — .15             | .04               | — .14             | .09   | .09    |
| MAS <sub>2</sub>  | .....            | .....            | .55*             | .88*             | — .15             | — .03             | — .15             | — .02 | — .08  |
| MAS <sub>3</sub>  | .....            | .....            | .....            | .80*             | — .15             | — .02             | — .14             | .12   | .04    |
| MAS <sub>t</sub>  | .....            | .....            | .....            | .....            | — .17             | — .02             | — .16             | .09   | .02    |
| SCAT <sub>v</sub> | .....            | .....            | .....            | .....            | .....             | .15               | .82*              | — .05 | — .24† |
| SCAT <sub>q</sub> | .....            | .....            | .....            | .....            | .....             | .....             | .65*              | .15   | — .04  |
| SCAT <sub>t</sub> | .....            | .....            | .....            | .....            | .....             | .....             | .....             | .05   | — .21  |
| GPA               | .....            | .....            | .....            | .....            | .....             | .....             | .....             | ..... | .77*   |

\*Significant  $p < .001$

†Significant  $p < .01$



Results

Table I reveals the following:

1. All subtest scores on the MAS correlated significantly with the  $MAS_t$  score. It will be noted that  $MAS_{33}$ , calculated from those items which Hoyt and Magoon found to be poorest indicators of clinical anxiety, correlates somewhat less well with  $MAS_1$  and  $MAS_2$  than do these subtest scores with each other, and also less well with  $MAS_t$  than do  $MAS_1$  and  $MAS_2$ .
2. All MAS scores correlated negatively with  $SCAT_v$  scores. In every instance the correlation was significant at the .10 level.
3. There are no significant correlations noted between MAS and  $SCAT_q$  scores.
4.  $SCAT_v$  and  $SCAT_q$  scores are positively related, but with significance only at the .10 level.
5. All MAS scores show negative correlations with the  $SCAT_t$  score. All correlations are of approximately the same magnitude, but whereas two are significant at the .10 level the other two scores are not.
6. Not surprisingly,  $SCAT_v$  and  $SCAT_q$  scores reveal a high positive correlation with  $SCAT_t$ .
7. All correlations between MAS scores and GPA are positive but non-significant. Interestingly, the  $MAS_3$  scores come quite close to significance at the .10 level.
8. Of the three SCAT scores, only  $SCAT_q$  shows a significant relationship with GPA, and this just at the .10 level.
9. None of the MAS scores shows a significant relationship with FPTG.
10. Of the three SCAT scores,  $SCAT_v$  and  $SCAT_t$  show negative correlations with FPTG. The former is significant at the .01 level and the latter at the .02 level of confidence.
11. GPA and FPTG reveal a correlation significant at well beyond the .001 level. As noted earlier, however, this relationship is spuriously high.

Discussion

The expected high and positive correlations between the various subtests of the MAS with each other and with  $MAS_t$  were found. Similarly, the correlations between the various subtests of the SCAT scores are in the expected direction. One of the more interesting findings is the negative relationship between ability to teach and academic aptitude as measured by two of the SCAT scores. Particularly surprising is the relatively high and negative relationship between verbal scores and teaching success for females. There is little in this study to suggest that

manifest anxiety influences either ability to teach or academic achievement adversely.

It would be of interest and value to repeat this study with a group of male teachers in training so that a comparison might be made with the findings reported above.

#### REFERENCES

- <sup>1</sup> R. Grooms and N. S. Endler, "The effect of anxiety on academic achievement", *Journal of Educational Psychology*, Vol. LI, 1960, pp. 299-304.
- <sup>2</sup> N. S. Endler and L. S. Snyder, "Anxiety, aptitude, and academic achievement", *Ontario Journal of Educational Research*, Vol. VI, 1964, pp. 85-91.
- <sup>3</sup> G. Mandler and S. B. Sarason, "A study of anxiety and learning", *Journal of Abnormal and Social Psychology*, Vol. XLVII, 1952, pp. 163-173.
- <sup>4</sup> Janet A. Taylor, "A personality scale of manifest anxiety", *Journal of Abnormal and Social Psychology*, Vol. XLVIII, 1953, pp. 285-290.
- <sup>5</sup> D. P. Hoyt and T. M. Magoon, "A validtaion study of the Manifest Anxiety Scale", *Journal of Clinical Psychology*, Vol. X, 1954, pp. 357-361.



*The author reports a study of the correlates of language learning for English-speaking children taught for the most part in a second language. The relationship of chronological age, mental age, and attitude to the variables of vocabulary size, pronunciation, and comprehension were investigated for children in a kindergarten where French is the language of instruction.*

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## The Correlates of Second Language Learning by Young Children

There are many assertions in the literature that the preschool years are the most suitable for learning a second language. Williams,<sup>1</sup> for example, asserts that "the earlier a child is introduced to a second language, the better", presumably arguing for two languages from birth. Villegas<sup>2</sup> says more precisely "the optimum age for beginning the continuous learning of a second language seems to fall in the span of age four through eight."

No justification is usually given for early instruction, and no experimental evidence to support these assertions was found.

Penfield's<sup>3</sup> neurological arguments have been cited to justify early teaching. This theory, however, is more relevant to the ability to pronounce the sounds of another language than to the ability to use a second language to formulate ideas or to communicate them.

More recently, Lambert<sup>4</sup> has shown the importance of attitude in bilingualism, particularly a generally favourable attitude to the culture concerned. Specifically, what he calls the "integrative motive" is the basis for a favourable attitude to a second language. He also pointed out the importance of the attitude of the student's family. "Students with an integrative disposition to learn French had parents who also were integrative and sympathetic to the French community" (p. 116).

Traditionally, general intelligence has been cited as the major relevant variable. Hobbs,<sup>5</sup> for example, summarized a number of studies and asserted that "the usual correlation between intelligence and second language learning is .50" (p. 18).

This study was designed to investigate, within the limits set by the subjects available, the relationship between learning a second language and the three theoretically relevant factors cited above: chronological age, parental attitude and general intelligence. Parental attitude was measured by a scale prepared for this purpose based in part on Lambert's Scale and in part on local and contemporary issues, and separately by a clinical estimate derived from a recorded interview. (Copies of the scale and a description of its preparation and the interview schedule may be obtained from the authors.) The Stanford-Binet Scale administered in English was the measure of intelligence. An estimate of home level of French was made during the parental interview.

Achievement in French is an ambiguous term which may in practice have several different definitions. For this study, three specific aspects of language skill were defined and measured separately. Vocabulary size was measured by a specially prepared translation of the Peabody Picture Vocabulary Scale. The test was administered at the beginning of the school year and again shortly before its end. Increase in vocabulary size was the first definition of language learning. The second definition was accuracy in pronunciation. This was measured by the teacher who placed each student on a seven point scale for improvement in pronunciation during the school year (Oral Skills). The third definition was less precise—general comprehension of spoken French (Aural Skills). Again a teacher estimate of improvement during the school year was used. The children were placed on a seven point scale of improvement.

The sample available for the study consisted of forty children, two classes in a *Jardin d'Enfance* conducted by the Sisters of Assumption in Edmonton. The relevant characteristics of this group were as follows:

|                    | Peabody | Blishen | CA   | IQ    | Attitude |
|--------------------|---------|---------|------|-------|----------|
| Mean               | 17.8    | 63.1    | 60.4 | 110.3 | 34.5     |
| Standard Deviation | 3.9     | 13.3    | 7.3  | 15.3  | 11.8     |

The scores on the French version of the Peabody scale are given as raw scores. The range of socio-economic status, as measured by the Blishen scale, was wide. The I.Q. mean was average for Edmonton. The mean score on the attitude scale, 34.5, was significantly higher than 22.3, the mean score of a random sample of freshman education students at The University of Alberta.

Results

A multiple regression analysis as developed by Bottenberg and Ward (1963) was made using the Computer program supplied by the Division of Educational Research Services at The University of Alberta. In an analysis of this kind the extent of each individual contribution to the criterion variance is assessed with the influence of all the other variables



held constant. This involves estimating the probability that a discriminate mean square for regression is larger than the error mean square. Because of the small population only three predictor variables could be used in this analysis. They are shown in Table I. However, Pearson product moment correlations between the three criterion variables and all of the predictors were calculated. They are given in Table II.

It can be seen from Table I that the three major predictors correlate most highly with the improvement in vocabulary as measured by the French translation of the Peabody Test and that chronological age is the significant variable here. The older children showed a greater increase in vocabulary than did the younger children. Attitude is marginally significant. The multiple correlation with improvement in comprehension, aural skills, is low and only chronological age is significant. For improvement in pronunciation, oral skills, the multiple correlation is not significant.

Conclusions

The evidence on the first question, the role of age, is complex. The older children in the study showed greater improvement in vocabulary and comprehension, but not in pronunciation. The results lend support to Penfield's assertion to this extent: the younger children improved their pronunciation as much as the older ones did. Within this age range, however, the older children were not handicapped in improvement in pronunciation. There do not appear to be any advantages to beginning second language instruction at age four rather than age six.

TABLE I  
SQUARED MULTIPLE CORRELATION COEFFICIENTS SHOWING  
VARIANCE CONTRIBUTED BY EACH MAJOR FACTOR

| Criterion    | Variable Partialled Out | Proportion of Variance Contributed RSQ | Significance of Difference Between Unrestricted and Restricted Models |
|--------------|-------------------------|----------------------------------------|-----------------------------------------------------------------------|
| Peabody Test | Unrestricted Model      | .482                                   | P < .01                                                               |
|              | Restricted Models       |                                        |                                                                       |
|              | 1. Attitude             | .408                                   | .05 < P < .06                                                         |
|              | 2. C.A.                 | .401                                   | P < .05                                                               |
| Aural Skills | 3. M.A.                 | .447                                   | Not sig.                                                              |
|              | Unrestricted Model      | .267                                   | P < .05                                                               |
|              | Restricted Models       |                                        |                                                                       |
|              | 1. Attitude             | .252                                   | Not sig.                                                              |
| Oral Skills  | 2. C.A.                 | .082                                   | P < .01                                                               |
|              | 3. M.A.                 | .237                                   | Not sig.                                                              |
| Oral Skills  | Unrestricted Model      | .103                                   | Not sig.                                                              |
|              | Restricted Models       |                                        |                                                                       |
|              | 1. Attitude             | .099                                   | Not sig.                                                              |
|              | 2. C.A.                 | .026                                   | Not sig.                                                              |
|              | 3. M.A.                 | .087                                   | Not sig.                                                              |

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TABLE II  
CORRELATIONS BETWEEN ALL VARIABLES AND KNOWLEDGE  
OF FRENCH

| Predictors                                            | Peabody Test | Aural Skills | Oral Skills |
|-------------------------------------------------------|--------------|--------------|-------------|
| Mental Age                                            | .529**       | .171         | .089        |
| Chronological Age                                     | .622**       | .463**       | .282        |
| Stanford-Binet<br>Vocabulary                          | .381*        | — .125       | — .185      |
| Home Level of French                                  | .332*        | .546**       | .530**      |
| Clinical Rating of Attitude<br>Towards French Culture | .431**       | .719**       | .615**      |
| Attitude Scale                                        | .359*        | .233         | .135        |

\*Significant at the .05 level

\*\*Significant at the .01 level

Lambert's variable, attitude, when measured by the scale, is important for vocabulary but not for the other two criterion variables. The less direct clinical rating, which was not included in the multiple regression analysis, correlated with each of the variables (Table II). It may be that the implication of items which discriminated well in a neutral interview was obvious to the parents in a more personally phrased questionnaire. The less direct measure may have tapped the basic values. If this interpretation is correct it is perhaps important that the highest correlation for this subject rating is with comprehension—the communication skill.

Finally, general intelligence correlated only with vocabulary and not with comprehension or pronunciation. If this skill is what is sought from second language learning, the intelligent are able to make most progress.

#### REFERENCES

- <sup>1</sup> J. L. Williams, "Bilingual Wales' Lessons for the Language Teacher," *Times Educational Supplement*, 1963, p. 299.
- <sup>2</sup> V. V. Villegas, "Foreign Languages from the First Grade," *American School Board Journal*, 1958, 41, p. 136.
- <sup>3</sup> W. Penfield and L. Roberts, *Speech and Brain Mechanism*, (Princeton, N.J.: Princeton University Press, 1959).
- <sup>4</sup> W. E. Lambert, "Psychological Approaches to the Study of Language Part II: on second language learning and bilingualism," *Modern Language Journal*, 1963, 47, pp. 114-121.
- <sup>5</sup> N. Hobbs, "Child Development and Language Learning," *School and Society*, 1953, 78, pp. 17-21.



*This study compares a number of experiences and attitudes of potential dropouts (those students who wish to leave school before graduation) with those of students who do not wish to leave school before graduation. The first section describes the method, the sample, and the plight of the students in the sample. The second illustrates the extent of variation between the two groups in eight areas. The third presents some relevant practical, philosophical, and theoretical considerations.*

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## Profile of the Potential Dropout

*If these two ingredients are present, aspiration and stimulation by knowledge and experience, little else matters; if they are not there real education will rarely take place.\**

The general hypothesis of this research study postulated that the values, attitudes, and activities of high school students in two schools are independent of their desire to remain in school. Tests of independence using the chi-square technique were run on eighty-six 2 x n tables. The statistical analysis was handled by computer at The University of Alberta.

The *Student Values Inventory*,<sup>1</sup> a survey questionnaire, was administered to 2,425 students of two urban composite Canadian high schools during February, 1966. The sample population is described in Table I.

TABLE I  
SOME CHARACTERISTICS OF STUDENT SAMPLE

| Sex   | Grades |     |     |     |      | Socio-Economic Group |        |     | Total |
|-------|--------|-----|-----|-----|------|----------------------|--------|-----|-------|
|       | IX     | X   | XI  | XII | XIII | High                 | Medium | Low |       |
| Boys  | 349    | 287 | 291 | 240 | 195  | 244                  | 608    | 510 | 1362  |
| Girls | 262    | 242 | 225 | 213 | 121  | 212                  | 473    | 378 | 1063  |
| Total | 605    | 529 | 516 | 453 | 316  | 456                  | 1081   | 888 | 2425  |

\*Sir Alec Clegg, "The Expansion of Knowledge and the Reform of the Curriculum", *Canadian Education Association 1966 Convention: Proceedings and Addresses*, p. 43.

The socio-economic status of students was obtained from student responses to the *Gough Home Index Scale*.<sup>2</sup> Those students checking 17-20 items fell into the high group, those checking 12-16 into the medium group, and those checking 0-11 into the low group. The responses of all students were used in this analysis. The students were asked to respond to the question, "If you had your choice, would you leave school before graduation?" Only 7.5 per cent of the 2,425 students checked "yes" to this question. Table II provides the breakdown for boys and girls and for the total group.

TABLE II  
NUMBER OF STUDENTS WHO WOULD LEAVE SCHOOL BEFORE  
GRADUATION AND THOSE WHO WOULD STAY

|                      | Boys | Girls | Total |
|----------------------|------|-------|-------|
| Wish to leave        | 97   | 85    | 182   |
| Do not wish to leave | 1250 | 964   | 2214  |

The responses of these 182 "leave" students to a number of attitudinal questions were compared with those of the remaining students. The variations will be reported under the topics of athletics, religion, academic orientation, conformity, and the influence of parents, teachers, and peers.

*Plight of the "Potential Dropout"*

Before turning to a comparison of the two groups on these areas it may be helpful to describe the students who desire to leave school. Table III presents three characteristics of these students. Evidently "unhappy" in school, infrequently enrolled in university bound courses, and with little future orientation, the "leave" group was suffering from experiences (real or otherwise, but to them perceived as real) which fostered attitudes contrary to those which the school wished to develop.

TABLE III  
PLIGHT OF STUDENTS

| Characteristic                          | Per Cent Responding |       |       |       |
|-----------------------------------------|---------------------|-------|-------|-------|
|                                         | Boys                |       | Girls |       |
|                                         | Leave               | Stay  | Leave | Stay  |
| Finding school experiences satisfactory | 52.6                | 82.3* | 64.7  | 83.1* |
| Enrolled in university entrance courses | 22.7                | 52.3* | 25.9  | 52.2* |
| Plans for university, teachers' college | 20.6                | 64.1* | 20.0  | 60.1* |

\*All differences are significant ( $p < .001$ )

*The Socio-Economic Group and the Potential Dropout*

Table IV reveals the socio-economic groups generating the majority of students who desire to leave school. The major source of the potential



dropout was the low socio-economic group. This is an expected finding that has been revealed by so many studies that its inclusion is well nigh trivial and can be justified only for the sake of completeness.

TABLE IV  
ORIGIN OF THE POTENTIAL DROPOUT

| Socio-Economic Group | Number of Students | Per Cent of Total "Leave" Group | Per Cent of Total Sample |
|----------------------|--------------------|---------------------------------|--------------------------|
| High (17-20)         | 13                 | 7.1                             | 2.8                      |
| Medium (12-16)       | 64                 | 35.2                            | 6.0                      |
| Low (0-11)           | 105                | 57.7                            | 11.8                     |

Major Areas of Variation

Seven headings are used to structure this report. As has already been the case, the students who desired to leave school before graduation will be designated "leave" students, those who did not wish to leave will be labelled "stay" students. Thus far this paper has shown (1) that "leave" students were more unhappy in school, (2) that "leave" students came from less privileged classes, and (3) that "leave" students were less future oriented academically than the "stay" students. In short, they were underprivileged in a number of ways.

Sports Orientation of Students

Table V provides information about five items describing the students' athletic orientation.

TABLE V  
ATHLETIC ORIENTATIONS OF STUDENTS

| Item                                 | Per Cent Responding |      |      |       |      |     |
|--------------------------------------|---------------------|------|------|-------|------|-----|
|                                      | Boys                |      |      | Girls |      |     |
|                                      | Leave               | Stay | P    | Leave | Stay | P   |
| Participation in football            | 61.9                | 75.9 | .01  | 52.9  | 63.9 | .10 |
| Participation in basketball          | 43.3                | 55.1 | .05  | 51.8  | 61.0 | .10 |
| Sports favourite TV program          | 28.9                | 35.0 | .30  | 9.4   | 8.4  | .80 |
| Athletics is important in school     | 49.5                | 57.3 | .30  | 40.0  | 48.3 | .20 |
| Physical education favourite subject | 30.9                | 20.9 | .001 | 25.9  | 20.8 | .20 |

Boys who desired to leave school participated less frequently in football and basketball than those who did not wish to leave. However, there was no significant difference between the two groups in their evaluation of sports as a favourite television program and of athletics as important in school life. Against this the "leave" boys placed a significantly higher value on physical education as their favourite subject. The two girls' groups did not differ significantly on any item.

Religious Orientation of Students

Table VI summarizes some of the attitudes of both groups toward religious activities. A significantly greater percentage of girls than boys responded positively to each of the four items.

A significantly greater per cent of the “stay” boys than of the “leave” boys stated that they wished to join a church, that they had attended Sunday School, and that they attended church. The girls of the two groups differed only in regard to Sunday School attendance; more of the “stay” girls than the “leave” girls had attended Sunday School.

TABLE VI  
RELIGIOUS ORIENTATION

| Item                                  | Per Cent Responding |      |     |       |      |     |
|---------------------------------------|---------------------|------|-----|-------|------|-----|
|                                       | Boys                |      |     | Girls |      |     |
|                                       | Leave               | Stay | P   | Leave | Stay | P   |
| Desire to join a church               | 64.9                | 77.1 | .05 | 81.2  | 84.8 | .70 |
| Attending church                      | 57.7                | 69.5 | .02 | 78.8  | 77.7 | .30 |
| Sunday school attendance              | 43.3                | 58.8 | .01 | 55.3  | 68.7 | .01 |
| Saying prayers before<br>going to bed | 45.4                | 46.2 | .10 | 64.7  | 67.9 | .70 |

Academic Orientation of Students

In the “desire to be remembered” as an outstanding student the variation between the two groups was not significant, even though the tendency was for the “stay” group to exceed the “leave” group in this wish. However, in the other four areas relating to academic achievement variation was significant for the boys, and in three areas for the girls. (See Table VII.) Even though the “leave” students tended to recognize the value in being an outstanding student, they had not internalized the process (working, striving, or developing an attitude to work toward academic goals).

TABLE VII  
ACADEMIC ORIENTATION

| Item                                                 | Per Cent Responding |      |      |       |      |      |
|------------------------------------------------------|---------------------|------|------|-------|------|------|
|                                                      | Boys                |      |      | Girls |      |      |
|                                                      | Leave               | Stay | P    | Leave | Stay | P    |
| Desire to be remembered<br>as an outstanding student | 38.1                | 50.9 | .05  | 54.1  | 59.7 | .30  |
| Doing one hour or more of<br>homework on a week-day  | 45.4                | 77.1 | .001 | 73.0  | 90.3 | .001 |
| Striving to learn as much<br>as possible in school   | 28.9                | 45.3 | .01  | 37.6  | 39.4 | .90  |
| Choose education as<br>highest value                 | 38.1                | 52.9 | .01  | 34.1  | 51.7 | .001 |
| Like to get a broad<br>general education             | 41.2                | 57.2 | .001 | 31.8  | 45.1 | .02  |



Conformity of Students in the Two Groups

Table VIII presents the evidence on conformity of the students in the sample. On every item significant differences existed between the “leave” group and the “stay” group, for both boys and girls. If society wishes to reduce premature school leaving and the related delinquency, it needs to look at the experiences of the individual who is alienating himself from the society in which he finds himself, and assist him in developing his own meaningful identity. As seen above, this is too often tarnished by failure and frustration. The individual clashes with the goals of an alien institution. Finally, he finds “joy” in simply opposing the “organization man” who is consumed with the mission of his institution. Corwin hints at this when he states that “. . . professional counselors have developed bureaucratic procedures and standardized categories to facilitate their search for talent.”<sup>3</sup> Is it possible that with their enormous powers of selection and bureaucratic organization counsellors have displaced one of their prime goals?

TABLE VIII  
NON-CONFORMITY OF STUDENTS

| Item                                                  | Per Cent Responding |      |      |       |      |      |
|-------------------------------------------------------|---------------------|------|------|-------|------|------|
|                                                       | Boys                |      |      | Girls |      |      |
|                                                       | Leave               | Stay | P    | Leave | Stay | P    |
| Students smoking                                      | 52.6                | 24.7 | .001 | 34.1  | 9.7  | .001 |
| Will go with friends even when parents do not approve | 49.5                | 35.2 | .01  | 31.8  | 17.0 | .001 |
| Will hand in a friend's assignment as his own         | 49.5                | 27.6 | .001 | 34.1  | 15.1 | .001 |
| Drinks beer                                           | 29.9                | 11.0 | .001 | 11.8  | 2.2  | .001 |
| Will keep a five dollar bill if found in school       | 64.9                | 49.2 | .01  | 30.6  | 17.5 | .01  |

Parent Influence

Table IX presents a summary of the responses to six items relating to parent influence. Variation was significant, especially between the two groups of boys. On every item parent influence was perceived as stronger by the boys in the “stay” group than those in the “leave” group. The girls’ groups differed significantly, and in the same direction, on items relating to parent influence, to parent concern for academic success, and to having a happy home life.

TABLE IX  
PARENT INFLUENCE ON STUDENTS

| Item                                                | Per Cent Responding |      |      |       |      |      |
|-----------------------------------------------------|---------------------|------|------|-------|------|------|
|                                                     | Boys                |      |      | Girls |      |      |
|                                                     | Leave               | Stay | P    | Leave | Stay | P    |
| Parents' disapproval is hardest to take             | 34.0                | 46.5 | .01  | 42.4  | 46.5 | .50  |
| Perceived parent influence as the most significant  | 53.6                | 64.3 | .05  | 52.9  | 66.9 | .02  |
| Parents concerned about academic success            | 86.6                | 96.5 | .001 | 89.4  | 96.9 | .001 |
| Would go west with parents rather than with friends | 40.2                | 60.0 | .001 | 64.7  | 69.7 | .30  |
| Students having a happy home life                   | 63.9                | 85.8 | .001 | 75.3  | 85.4 | .01  |
| Mother has a job outside the home                   | 59.8                | 43.1 | .01  | 48.2  | 42.1 | .30  |

*Teacher Influence*

The variation of teacher influence on the two groups is summarized in Table X. On the whole, teacher influence, as perceived by students, fared poorly when compared with parent and peer influence. The "leave" boys found teacher disapproval hardest to take and perceived school experiences as unsatisfactory in significantly larger numbers than the "stay" boys. However, significantly more of the latter stated that teachers did understand and assist teen-agers. A significantly smaller percentage of the "stay" girls than the "leave" girls found school experiences unsatisfactory, and a larger percentage stated that their teachers understood teen-agers and assisted them. It is significant that only 21.6 per cent of the "leave" boys and 17.6 per cent of the "leave" girls perceived their teachers as able to understand teen-agers and willing to assist them.

TABLE X  
TEACHER INFLUENCE

| Item                                                              | Per Cent Responding |      |      |       |      |      |
|-------------------------------------------------------------------|---------------------|------|------|-------|------|------|
|                                                                   | Boys                |      |      | Girls |      |      |
|                                                                   | Leave               | Stay | P    | Leave | Stay | P    |
| Teacher disapproval hardest to take                               | 13.4                | 6.2  | .01  | 9.4   | 7.1  | .50  |
| Teacher influence most important                                  | 6.2                 | 4.6  | .50  | 4.7   | 4.2  | .80  |
| School experiences unsatisfactory                                 | 46.4                | 16.3 | .001 | 34.1  | 15.3 | .001 |
| Would like to resemble a favourite teacher most                   | 11.3                | 8.9  | .50  | 8.2   | 9.1  | .70  |
| Perceiving teachers as understanding teenagers and assisting them | 21.6                | 35.1 | .01  | 17.6  | 35.7 | .01  |

*Peer-Group Influence*

Table XI offers some evidence on variations of peer-group pressures on members of the two groups under consideration. The greater power



of the peer-group over the "leave" students than over those who wish to remain in school may be either cause or effect, or both. That the alienated, frustrated adolescent increasingly turns to his peers for acceptance, legitimation, and identification is a theory that receives some support from these findings. Both boys and girls in the "leave" group spent significantly more evenings a week with the "gang" than those in the "stay" groups. Boys of the former groups chose much more frequently than those in the latter group to go with friends rather than with parents. The "leave" girls in significantly larger numbers than the "stay" girls perceived the influence of friends as most important.

TABLE XI  
PEER INFLUENCE

| Item                                                     | Per Cent Responding |      |      |       |      |     |
|----------------------------------------------------------|---------------------|------|------|-------|------|-----|
|                                                          | Boys                |      |      | Girls |      |     |
|                                                          | Leave               | Stay | P    | Leave | Stay | P   |
| Breaking with a friend hardest to take                   | 47.4                | 45.1 | .50  | 47.1  | 44.5 | .70 |
| Influence of friends most important                      | 36.1                | 27.3 | .10  | 36.5  | 26.8 | .05 |
| Strives most to be accepted and liked by students        | 32.0                | 26.2 | .20  | 22.4  | 31.5 | .10 |
| Spends two or more evenings a week with the "gang"       | 63.9                | 41.2 | .001 | 40.0  | 27.3 | .01 |
| Choose to go camping with friends over trip with parents | 52.6                | 37.6 | .001 | 34.1  | 28.1 | .30 |

### A Summary—The Escape

This study has been an analysis of differences between students who would, if given opportunity, leave school before graduation and those who wished to stay. Major differences were observed in their perception of school experiences, church activities, academic orientation, conformity, parent influence, teacher influence, and partly in peer-group influence. A variety of situations was seen in a more negative light by the would-be-dropout. How does the "leave" student react to his feeling of alienation? One common explanation of the problem is that the preoccupation of students with activities outside the sphere of the role as a student account for the lack of interest in school. Poor school adjustment stems from orientation to outside interests and the failure to establish relevancy of school experiences. Another explanation could be advanced. Finding school, home, and church activities less than satisfying the student seeks activities which will give him the pleasure and status he needs. This explanation receives some support from the data of this study.

Table XII lists some of the activities which have absorbed the interest and time of the students who desired to leave school.

TABLE XII  
VARIATIONS IN ACTIVITIES OF STUDENTS IN THE TWO GROUPS

| Item                                               | Per Cent Responding |              |      |                |               |      |
|----------------------------------------------------|---------------------|--------------|------|----------------|---------------|------|
|                                                    | Boys<br>Leave       | Boys<br>Stay | P    | Girls<br>Leave | Girls<br>Stay | P    |
| Going steady                                       | 39.2                | 22.3         | .001 | 51.8           | 25.8          | .001 |
| Dating more than twice a week                      | 22.7                | 8.0          | .001 | 28.2           | 8.5           | .001 |
| Owning cars                                        | 18.6                | 7.9          | .001 | 4.7            | 1.3           | .01  |
| Watching T.V. three hours<br>or more on a week-day | 32.0                | 12.4         | .001 | 24.7           | 11.0          | .001 |
| Attending movies once a<br>week or more            | 23.7                | 9.5          | .001 | 21.2           | 9.2           | .001 |

Nine of the ten differences between the “leave” and the “stay” groups were significant beyond the .001 level. The “leave” students were significantly more inclined than the “stay” students in “going steady”, in dating frequently, in owning cars, in watching television at great length, and in movie consumption. Where the “leave” student has not found satisfaction in school, he now finds it in a variety of ways outside the school.

*Implications and Considerations*

This study has revealed that there is within these two schools an identifiable group of students who wish to leave school before graduation. Society, however, forces them to stay. The experiences gained by these would-be-dropouts are unsatisfactory; they fail to stimulate them toward learning. Further, this study has revealed that the potential dropout in school may be “unhappy” from any one or a combination of reasons. In this regard Etzioni’s analysis of organizational dilemmas may apply to schools. He states that:

Many people who work for organizations are deeply frustrated and alienated from their work. . . . Satisfied workers usually work harder and better than frustrated ones . . . organizational rationality and human happiness go hand in hand. . . . The problem of modern organizations is thus how to construct human groupings that are as rational as possible, and at the same time produce a minimum of undesirable side effects and a maximum of satisfaction.<sup>4</sup>

It must be recognized that the school is a unique organization. The power structure is diffused in the total society; the organizational goals are far from explicit; control is mostly through social and legal power; the clientele is captive, it is present not by choice; and the screening out of unsatisfactory persons is contrary to current thought. How can this organization construct its operation to increase satisfaction when limited in its control factors?

Research is not definitive in this area; however, several directions have shown merit. The following discussion begins with a philosophical note, moves to some practical considerations, and ends with a reference



to related theory. The discussion is not meant to be an answer, nor to be inclusive—just to stimulate reflection on the problem.

(1) The large-scale organization is here to stay. Yet within this organization educators need to see not the spaces or numbers but the individuals. “It is the human spirit that we must nourish. This is one of the primary tasks of the teacher.”<sup>5</sup> If equality is to be realized it cannot be found in intelligence, it must be found in humanity; there is no recourse to equality but through humanity. This demands recognition of the individual, his problems, and his role in society. “In the last analysis, the fundamental problems which our students face, are problems solved in terms of human values.”<sup>6</sup> Thus the unchallenged acceptance of patterns of culture in place of humanity is defeatist, perhaps even fatalist.

(2) The challenge issues to the total society. Parents, church, peer-groups, industry, business, the professions, and government are all involved in assisting the school to meet the problem of the potential dropout. The economic council states that 350,000 eighteen-year-olds were looking for jobs in 1966; 200,000 will begin their search annually to 1970. “In an affluent, expanding economy, operating parallel to an automated technological society, this is our greatest crisis.”<sup>7</sup> One of the miracles wrought by Assistant Superintendent Samuel Shepard, Jr. in the 95 per cent Negro Banneker District in St. Louis, has been a reversal of dropout trends among 15,000 pupils in his twenty-three schools. Shepard reduced the rate from more than a third to less than one in ten by motivating parents as well as students.<sup>8</sup>

(3) Rigidity in the organization of the large school unit may mitigate against the type of student in question. Developing flexibility to provide a wider scope of meaning, enjoyment, participation, discovery, reward, and recognition to include the entire clientele remains a vexing problem, but one that needs examination. “The primary purpose of education must be the individual and his fulfillment for a satisfying life.”<sup>9</sup>

(4) Presenting real alternatives for choice is possible with today’s technology. Developing the student’s responsibility and interest by involving him in real choices in method and content may help to ignite his self-actualization process. Do schools permit student responsibility to develop? Equipment, technology, affluence, and knowledge exist for a new era in education. Can the human elements and the organizational structures be developed to make the innovations serve man positively?

(5) Examine the adult-imposed status-seeking structure of the adolescent experience. The emphasis on the intellectual has relegated “the whole person” to a position of insignificance. Yet voices of concern are heard. “. . . the ever-widening gap of privilege between the intellectually slow and the intellectually quick will be the most serious disease of our

new meritocracies in the 21st century.”<sup>10</sup> Probably a significant portion of our school clientele is suffering as a result of this disease even now.

(6) Lower class adolescents leave school prematurely not so much because of anti-educational values as of a rejection by teachers of the lower class child for what he is and what he feels.<sup>11</sup> This finding receives some support in the present study. About 46 per cent of the students who desired to leave school still wanted to be remembered as outstanding students. Of the remaining students about 54 per cent wished the same. Thus the potential dropouts perceive themselves as on the outside of the school looking in, but not identifying with it. There may be considerable truth in the first statement below, and much truth in the second.

But a major source of trouble lies in schools that don't teach, an economy without jobs, and school officials who give youngsters a hypocritical runaround, instead of the “second chance” their posters advertise.<sup>12</sup>

The future of any country which is dependent on the *will* and *wisdom* of its citizens is damaged, and irreparably damaged, whenever any of its citizens is not educated to the fullest of his capacity.<sup>13</sup>

### *Theoretical Conjectures—A Strategy*

Organizational control to achieve its goals is the area that exhibits most clearly the strain between the organization's needs and the individual's needs. Though the two sets of needs supplement or support each other in part—and for the compatible part need no control—in part they fail to mesh completely. Here control is necessary.

Since the school as an organization serves a specific purpose which occasionally clashes with the need of the individual student, it takes action to insure maximum achievement of goals. It distributes its rewards and sanctions according to performance and thereby establishes machinery to penalize those whose performance deviates from the norms.

Control has been classified according to the base of power from which it emanates. Thus control based on physical means is ascribed as coercive power. The use of material means for control constitutes utilitarian power, and the use of pure symbols of prestige and esteem or love and acceptance is known as normative or social power.

The use of power for control obtains different consequences. Coercive power is more alienating than utilitarian power, and the utilitarian power is more alienating than normative power (depending on cultural background and organizational structure).<sup>14</sup>

The alienation of members of the clientele from the organization's goals seems to be at stake in the sample of this study. To put it in a different way, the students who wished to leave school had not been stimulated to generate a commitment toward learning. The students appear to be kept in school by either coercion or utilitarian power. Again utilitarian persuasion seems absent since that would have led the students



to see material gain in the school program. Thus it appears that the coercive form of control was the main one. By its very nature, however, coercive control may force provisional compliance, at the same time tending to alienate the students even more from the core of the school's program.

Etzioni maintains that, "Normative power is predominant in religious organizations, ideological-political organizations, colleges and universities, voluntary associations, schools, and therapeutic mental hospitals."<sup>15</sup> Even though the above is generally accepted as correct for institutions, it may not be true for the individual student who would like to leave school but cannot. For him the normative power may not be operative.

Sociologists point out that the more coercive the means of control, the more alienating the use of power; and also the more normative the means of control the more commitment will be generated. The clientele of a school that wishes to leave may need an infusion of such normative control to awaken a commitment. What is the philosophy of control in the modern high school? At whom is prestige and esteem directed? What role do love and acceptance play in the school?

#### REFERENCES

- <sup>1</sup> The *Student Values Inventory* is a questionnaire designed on the models of James Coleman, William Knill, and Henry Zentner.
- <sup>2</sup> The *Gough Home Index Scale* for Canadian usage purports to have a reliability coefficient of  $r = .74$ , and a re-test reliability coefficient of  $r = .989$ . The twenty items take into account the factors of home ownership, education of parents, cultural activities, ownership status items, reading, books, and leisure activities.
- <sup>3</sup> Ronald G. Corwin, *A Sociology of Education*, (New York: Appleton-Century-Crofts, 1965), p. 201.
- <sup>4</sup> Amitai Etzioni, *Modern Organizations*, (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964), p. 2.
- <sup>5</sup> Malcolm Taylor, "The Role of the Teacher", *School Progress*, Vol. XXXV, No. 11, 1966, p. 34.
- <sup>6</sup> H. S. Wyndham, "C.E.A. Spotlights Education's Triple Challenge", *Ibid.*, p. 32.
- <sup>7</sup> C. H. Rushton, "Is It Drop-out or Shove-out?" *Ibid.*, pp. 42-43.
- <sup>8</sup> Bernard Bard, "Why Dropout Campaigns Fail", *Saturday Review*, September 17, 1966, p. 96.
- <sup>9</sup> John Deutsch, quoted in *School Progress*, *Op. Cit.*, p. 33.
- <sup>10</sup> Sir Alec Clegg, quoted in *Ibid.*, p. 34.
- <sup>11</sup> Edwar Z. Friedenberg, "Come Back to High School, Huck . . ." *Teacher's College Record*, No. 67, March, 1966, p. 448.
- <sup>12</sup> Bernard Bard, *Op. Cit.*, p. 97.
- <sup>13</sup> John F. Kennedy, "State of the Union Message to Congress", 1963.
- <sup>14</sup> Amitai Etzioni, *Op. Cit.*, p. 60.
- <sup>15</sup> *Ibid.*





*Concern is frequently expressed over the extent to which pupils transfer from school to school. A recent study investigated the degree of pupil mobility in a school system and ascertained relationships between mobility and aspects of school achievement. The results suggest interesting implications for educational practice.*

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## Pupil Mobility and School Achievement

It is a truism that we live in a rapidly-changing society. The effects of such changes upon the educational endeavours of schools are very great indeed; they have assisted in stimulating consideration and reconsideration of almost every phase of education.

One characteristic of modern life is the tendency for the population to be geographically mobile. In the United States, about one-fifth of all Americans change residences each year; approximately one-third of these cross county lines and about one-sixth make interstate moves. It is further estimated that not more than two to three per cent of the adult population spend their entire lives in the same house or apartment, and not more than ten to fifteen per cent live their entire lives in the same county.<sup>1</sup>

It is likely that such a significant characteristic of modern life will profoundly affect education, chiefly through the mobility of school students. In particular, it is often assumed that frequent moves from school to school may affect school achievement and social adjustment. Concern over this problem is probably greatest in those areas of the United States which have a large proportion of migrant agricultural workers, for, in such localities, student population may increase as much as 100 per cent during the harvest season.<sup>2</sup> However, a number of studies indicate that parents, teachers, and pupils also tend to be concerned about school

transfer where the problem is less acute. Objective studies of relationships between mobility and school achievement and adjustment are relatively few in number and appear to vary greatly in their findings. Some investigators have found positive relationships, others have obtained negative results, while still other studies provide no distinct pattern.

In Canada, concern about interprovincial transfer prompted publication of two Canadian Education Association information bulletins on the subject. In the first of these, an analysis of Family Allowance statistics provided the conclusion that approximately 1.6 per cent of the total school enrolment changed provinces between July 1, 1963, and June 30, 1964.<sup>3</sup> A later survey of 89 school systems in eight provinces showed that slightly less than one per cent of the total high school enrolment moved from one province to another during the 1964-65 school year. In regard to school achievement, it was found that approximately 14 per cent of those who had interprovincial transfers were subsequently downgraded, and an equal proportion upgraded.<sup>4</sup> However, one may well question whether the gain or loss of a complete school year is an adequate measure of relationship between mobility and school achievement.

In any case, interprovincial transfer is only one aspect of the problem. Of even greater importance, perhaps, is pupil mobility between schools or school systems, and in this respect there appears to be little if any available research in Canada. In view of this, and also considering the inconsistency of results in findings elsewhere, it would appear that Canadian educators need much more specific information on which to base opinions concerning pupil mobility.

#### *A Recent Canadian Study*

A recent study investigated the nature and degree of pupil mobility in a Saskatchewan school system, certain characteristics of mobile children, and relationships which existed between mobility and various aspects of school achievement.<sup>5</sup>

For purposes of the study, the term mobility was used to refer to the movement of a pupil from one school to another during the first eight grades of school. A mobile student, therefore, was one who had changed schools at least once during this time. A non-mobile student had made no such transfers. The study was limited to grade eight pupils enrolled during the 1964-65 school year in the Saskatoon Public Schools, an urban school system which provides education for pupils of grades one to eight in the city of Saskatoon, Saskatchewan.

Information on pupils was gathered from school records and from a pupil questionnaire administered to all students in the sample. The latter was checked for reliability by means of a questionnaire sent to a random sample of parents. Data obtained for each pupil consisted of scores on an



intelligence test and on standardized tests in reading, language, and arithmetic, grade eight year-end average, number of grades repeated or conditional promotions received, occupation of parent, number of school transfers made, recency of the latest transfer, whether the most recent transfer was made during the school year or during the summer months, and whether the pupil had always been enrolled in the Saskatoon Public Schools or had transferred from outside the school system. Pupils were classified into one of seven groups: a non-mobile group, three within-city groups consisting of pupils who had made one, two, or three or more transfers respectively but had always been enrolled in the Saskatoon Public Schools, and three outside-in groups also consisting of pupils who had transferred once, twice, or three or more times, but who had entered the school system from elsewhere sometime during the first eight grades. Null hypotheses were proposed and tested that groups did not differ significantly on intelligence test or achievement scores, proportions of pupils who had repeated grades or received conditional promotions, and proportions of pupils whose parents fell into each of five occupational classes.

All mobile pupils were also classified into three groups on the basis of recency of the latest transfer, and each such group was compared with the non-mobile group on intelligence test scores and achievement.

Findings

Nature and Degree of Mobility

A number of the findings consisted of descriptive information concerning the sample studied. These are summarized below:

(1) A total of 1,185 pupils were included in the sample. Of these, 408 or 34.43 per cent had made no school transfers during the first seven grades and two months of school. The entire sample made a total of 2,043 transfers, which is an average of 1.72 per pupil. A summary of the transfers made by the mobile pupils is shown in Table I. Approximately

TABLE I  
TRANSFERS MADE BY MOBILE PUPILS

| Number of Transfers | Number of Pupils | Percentage of Total Sample |
|---------------------|------------------|----------------------------|
| 1                   | 359              | 30.30                      |
| 2                   | 183              | 15.44                      |
| 3                   | 104              | 8.78                       |
| 4                   | 59               | 4.98                       |
| 5                   | 27               | 2.28                       |
| 6                   | 21               | 1.77                       |
| 7                   | 12               | 1.01                       |
| 8                   | 5                | .42                        |
| 9                   | 1                | .08                        |
| 10                  | 3                | .25                        |
| 11                  | 2                | .17                        |
| 12                  | 1                | .08                        |
| Total               | 777              | 65.56                      |

30 per cent of all pupils transferred once, 15 per cent transferred twice, nine per cent changed schools three times, and the remaining 12 per cent more than three times. Unfortunately, none of the studies found by this investigator provided data to which comparisons could readily be made.

(2) A total of 394 pupils, or 33.25 per cent of the sample, entered from outside the system sometime subsequent to enrolment in grade one.

(3) Of the 777 mobile pupils, 324 or 41.7 per cent made their most recent transfer during the school year, and 453 or 58.3 per cent transferred during the summer months. When pupils were classified into the six mobile groups described earlier, the percentages were similar for each group with approximately 35 to 45 per cent changing schools during the school year and 55 to 65 per cent transferring during the summer.

### *Degree of Mobility, Intelligence, and Achievement*

When the cumulative frequency distributions of Otis Beta Mental Ability Test scores for the various groups were compared by means of the Kolmogorov-Smirnov Two-Sample Test, no differences significant at the one per cent level of confidence were found. The conclusion reached, therefore, was that no relationship existed between degree of mobility and intelligence test scores.

Measures of school achievement used included scores obtained on standardized tests in arithmetic, language, and reading, as well as grade eight year-end average. In general, calculated mean values on each of the measures, shown in Table II, tended to be somewhat higher for the two groups consisting of pupils who had always attended Saskatoon Public Schools and who had made one or two transfers respectively, than for the non-mobile group or the other mobile groups. However, Kolmogorov-Smirnov tests using the cumulative frequency distribution for each group sustained null hypotheses that differences between the

TABLE II  
CALCULATED MEAN SCORES ON IQ AND  
ACHIEVEMENT FOR NON-MOBILE AND MOBILE GROUPS<sup>a</sup>

| Group      | Otis<br>IQ | Gates<br>Reading | Iowa<br>Language | Iowa<br>Arithmetic | Grade Eight<br>Average |
|------------|------------|------------------|------------------|--------------------|------------------------|
| Non-mobile | 108.17     | 8.78             | 9.04             | 8.07               | 68.13                  |
| WC1        | 109.92     | 9.13             | 9.28             | 8.31               | 69.36                  |
| WC2        | 110.61     | 9.32             | 9.34             | 8.26               | 69.60                  |
| WC3+       | 109.30     | 8.59             | 8.94             | 8.13               | 66.62                  |
| OI1        | 106.94     | 8.77             | 8.98             | 8.14               | 67.88                  |
| OI2        | 108.59     | 8.66             | 8.95             | 8.28               | 66.58                  |
| OI3+       | 107.66     | 8.73             | 8.85             | 8.16               | 66.65                  |
| Total      | 108.60     | 8.87             | 9.07             | 8.17               | 68.05                  |

<sup>a</sup> Means on the Gates Reading, Iowa Language, and Iowa Arithmetic tests are given as grade scores. Grade eight average is expressed as a percentage. The symbol WC1 indicates the group consisting of pupils who have made one transfer within the city; WC3+, the within-city group with three or more transfers; OI1 the outside-in group with one transfer, etc.



non-mobile group and each of the mobile groups were not significant, with the exception of two cases.

Significant differences in these two cases indicated that pupils who have always attended Saskatoon Public Schools and have transferred once or twice scored significantly higher at the one per cent level than did non-mobile pupils on the Gates Reading test.

A comparison was also made among groups on the proportion of pupils who had made grade repetitions or had received conditional promotions during previous years of elementary school. This information was available only for pupils who had always attended the Saskatoon Public Schools. No distinction was made for purposes of this study between a grade repetition and a conditional promotion, since both indicate unsatisfactory school achievement and promotion policy in the school system requires that the decision as to which is used for a particular pupil in a particular year will involve factors other than measures of school achievement. Of the non-mobile pupils 16.91 per cent had had at least one grade repetition or conditional promotion. Percentages for the other groups were: 17.06 per cent for the within-city group with one transfer, 21.43 per cent for the within-city group with two transfers, and 31.91 per cent for the group with three or more transfers. Results of chi-square tests indicated that the proportion for the mobile groups was not significantly different at the one per cent level than for the non-mobile group although significance was approached in the case of the group with three or more transfers.

It seems justifiable to suggest that a moderate degree of relationship exists between increasing mobility and increasing number of grades repeated or conditional promotions received, although differences were not found significant at the one per cent level.

### *Occupational Status*

Comments are frequently heard that people in certain socio-economic classes tend to be more mobile than those in other classes. Results of this study do not support this statement in so far as pupils in the Saskatoon Public Schools are concerned. Parents' occupations were grouped into five occupational classes using a scale developed by Blishen.<sup>6</sup> The proportions of pupils whose parents fell into the various classes were not found to be significantly different at the one per cent level for the non-mobile group compared with any of the mobile groups when tested by means of a chi-square test.

### *Continuous Enrolment in the School System*

Each of the Within-City Mobile Groups was compared with the Outside-In Group with a corresponding number of transfers. Differences between groups on intelligence test scores and the four measures of

achievement were found not significant at the one per cent level in all but one case. This case provided the conclusion that of pupils with two transfers, those who had transferred only within the school system scored significantly higher on the Gates Reading test than those who entered from outside the system.

### *Recency of Mobility*

Mobile pupils were also classified as follows on the basis of recency of the latest transfer: those who had transferred since June 30, 1964, those who had transferred sometime between June 30, 1963, and June 30, 1964, and those who transferred prior to June 30, 1963. Comparisons were made with non-mobile pupils on intelligence test scores, Gates Reading scores, and grade eight average.

No differences significant at the one per cent level were found between the non-mobile group and the three mobile groups on any of the three measures. Significance was approached on the Gates Reading test scores for mobile pupils in attendance at the present school the longest time. In this case, the latter group tended to score higher than the non-mobile pupils.

### *Conclusions and Implications*

(1) A number of limitations of this study should be recognized. First of all, validity of results depends to a considerable degree upon the validity of the measuring devices used, and this may be questioned in some cases. The occupational class scale used, for example, was based on data from the 1951 census and occupational rankings may well have altered since that time. Other examples might include the standardized tests which are not always valid measures.

While results obtained should be reasonably valid at this time for the Saskatoon Public Schools, a great deal of caution should be used in attempting application of the results to other populations. Very little information is available on pupil mobility in Canada, and it is quite likely that patterns of mobility vary greatly from place to place and time to time.

(2) The results of this study certainly provide no great cause for alarm over the plight of mobile pupils in the Saskatoon Public Schools. Almost no significant differences in school achievement were found between non-mobile and mobile pupils. In fact, the two significant results obtained on Gates Reading scores favoured pupils who had moved once or twice but had always attended Saskatoon Public Schools. While other scores were not found significantly different at the one per cent level, the general tendency seemed to be for moderately mobile pupils to score as well as or better than non-mobile pupils on most achievement measures.



The one contradictory finding was that pupils who transfer three or more times may have a greater tendency to repeat grades or receive conditional promotions than do non-mobile pupils. While this finding was not quite significant at the one per cent level, it is possible that frequently transferring pupils experience temporary difficulties which result in promotional problems.

Of course, results obtained apply to the group as a whole and not necessarily to individual pupils. It is obvious from the concerns expressed by writers, parents, teachers and pupils, that some children do have problems when they change schools, but whether these problems are permanent or temporary, or whether they are related to achievement or adjustment is not clear. It would seem that such difficulties are really part of the larger area of individual differences in general, and continued emphasis within this school system and others upon the individualization of instruction is probably the most fruitful approach to countering problems of pupil mobility. In fact, one might easily conjecture that the slight tendency in this study for moderately mobile pupils to achieve better than non-mobile pupils is related to increased teacher and school attention which a child may receive subsequent to a transfer.

(3) Approximately one-third of the pupils included in this study had entered the school system from outside sometime during the first seven grades and two months of school. Another one-third had always attended the Saskatoon Public Schools but had made one or more school transfers, and the remaining one-third had been in continuous enrolment at one school. It would obviously be unjustified, therefore, to assume that a continuous eight-grade programme of experiences within the school or school system can be planned for most pupils. It would seem similarly probable that curriculum planning within any school system should take cognizance of the degree of pupil mobility which exists. This would, of course, necessitate the establishment of some definite procedure to observe developing or changing patterns of mobility. A periodic calculation of the average number of transfers per pupil could conceivably provide a useful and relatively simple means of such observation.

(4) This investigation obviously has not exhausted the possibilities for research into pupil mobility. Replication of the study at other grade levels and in other locales could provide much useful information. The areas of achievement considered were largely in the skill subjects, and investigation of relationships with other academic areas as well as with aspects of pupil adjustment deserves consideration. Achievement and adjustment problems experienced by pupils when they transfer from school to school may also be associated with differing personality characteristics and intelligence. Such aspects of pupil mobility would likewise be fruitful ones for study.

REFERENCES

- <sup>1</sup> N. B. Henry, (Editor), *Social Forces Influencing American Education*, (Chicago: University of Chicago Press, 1961), p. 97.
- <sup>2</sup> G. E. Haney, "Problems and Trends in Migrant Education", *School Life*, Vol. XL, No. 9, 1963, pp. 5-9.
- <sup>3</sup> Canadian Education Association, *Interprovincial Transfers*, (Toronto: The Association, March, 1965).
- <sup>4</sup> Canadian Education Association, *A Survey of Interprovincial Transfers at the High School Level*, (Toronto: The Association, January, 1966).
- <sup>5</sup> R. A. Wickstrom, "Pupil Mobility in the Saskatoon Public Schools", Unpublished Master's Thesis, (Saskatoon: University of Saskatchewan, 1966).
- <sup>6</sup> B. R. Blishen, "The Construction and Use of an Occupational Class Scale", *Canadian Journal of Economics and Political Science*, Vol. XXIV, 1958, pp. 519-531.



*This article presents an analysis of the relationship between transiency and student test achievement obtained by testing nine null hypotheses relating to characteristics of the student, such as sex and intelligence, and to circumstances surrounding the transfer, such as the type of the transfer, the time of year in which the transfer occurred, and the number of transfers made by each student.*

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## Relationship between Transiency and Test Achievement

### *Introduction*

Although an increased mobility rate for all segments of the population has come to be accepted as another condition of the current times, the many problems associated with high mobility are far from being solved. High population mobility affects education in numerous ways; the most direct impact on the operation of schools and classrooms, and on teaching and learning, comes in the form of increased pupil transiency. Teachers and administrators, as well as parents and students, are faced with the variety of problems entailed in the transfer of students from one school to another whether this takes place within school district boundaries or across district, provincial, or national boundaries. Basic to the general concern on the part of those directly involved in pupil transfers is the question of the effect which transiency may have on immediate academic achievement and general school progress. Even though research which has been prompted by this question extends through several decades, the investigation of the problem has been intermittent and characterized by the frequently-encountered conflicting and inconclusive results.

In a review of some of the earlier research, Huus cited studies which reported superior achievement for non-transients, superior achievement for transients, and superior achievement for either group in certain areas under certain conditions.<sup>1</sup> More recently Bollenbacher reported that achievement in reading and arithmetic, as measured by standardized tests, was not affected by mobility in the grade six group which she studied.<sup>2</sup> This finding supported the results of earlier research by Fuller and Tetreau which had indicated that the average number of moves each year had no bearing on reading achievement.<sup>3</sup> On the other hand, Munzer's study indicated that pupils who had experienced low mobility obtained higher academic achievement scores than did pupils of high mobility.<sup>4</sup> An investigation into the effects of transiency on the marks of grade nine students carried out by Nyberg revealed only one significant difference between transients and non-transients; the difference favored non-transient students in social studies achievement.<sup>5</sup> He also observed that differences in other subjects which are based on an organized body of knowledge, although small, tended to favor non-transient students.

The inconclusive results of previous research suggest a need for further studies which strive to overcome deficiencies and limitations in relation to sample size, methods of analysis, and control of relevant variables which may have a bearing on the relationship between transiency and achievement. This report is based on a study which attempted to move toward a more complete and systematic approach to the problem.<sup>6</sup>

### *Purpose of the Study*

The main purposes of the present study were: (1) to investigate the relationship between transiency and student test achievement, and (2) to study the extent to which this relationship was influenced or conditioned by variables such as sex, intelligence, number of transfers, type of transfer (intra-system, intra-provincial, or inter-provincial), and the time of year of the transfer.

That there is a need for studies of this type is evidenced by the attention which the problem of transiency has received from a number of organizations including the Canadian Home and School and Parent-Teacher Federation,<sup>7</sup> the Canadian Education Association,<sup>8</sup> and the provincial Departments of Education.<sup>9</sup> The lack of research on the effects of transiency, particularly in relation to achievement, has sometimes led to conclusions and suggestions for action based more on opinion than on systematic study. Consequently, some groups have indicated that they favour action such as standardizing a core curriculum to assist transient students on the basis of the impressions of parents that children had experienced serious difficulty in adjusting to differences in curricula between



provinces.<sup>10</sup> Research into the magnitude and the nature of the relationship between transiency and test achievement may help to assess the need for such action and perhaps suggest other possible means of mitigating any ill effects which may result from pupil transfers.

### *Design of the Study*

#### *Sample*

The sample of this study included all grade six pupils in the Edmonton R.C. Separate School system enrolled as of June, 1964. Of the 1,341 pupils who were included in the study, 700 were classed as transients; that is, they had transferred from one school to another one or more times since entering grade one. The non-transient group consisted of the 641 students who had remained in the same school since entering grade one.

#### *Instrumentation*

In addition to data which permitted categorization of pupils in terms of transiency, measures were required for two sets of variables: (1) those to be used as control variables, and (2) those used as criteria of achievement. The Otis Self-Administering Test of Mental Ability, Intermediate Form A, and the Occupational Class Scale as constructed by Bernard R. Blishen<sup>11</sup> were the instruments used to obtain measures on control variables. The instruments used to obtain criteria of achievement were the Gates Reading Survey, Form 2, and the Form II Edmonton Separate School Elementary Standardized Tests (ESSEST) in Arithmetic, Language, Elementary Science, and Spelling.

#### *Sources of Data*

All test achievement scores, which included the Otis Test scores, the ESSEST scores, and The Gates Reading Survey scores, were obtained from the Edmonton R.C. Separate School Board Office files.

The name and sex of the pupil, the occupation of the father or guardian, and the pupil transiency data were obtained by means of questionnaires which were explained to the students and which were either completed or checked for validity and accuracy by the parents. All questionnaires were satisfactorily completed and returned.

#### *Hypotheses and Analysis*

Nine hypotheses based on previous research and related literature were proposed. Eight of the associated null hypotheses were tested by means of an Analysis of Covariance design through which mean scores in arithmetic, language, science, spelling, and reading were adjusted for

differences in student ability and parents' occupational status. These hypotheses were as follows:

There are no significant differences in achievement—

1. between transient and non-transient girls
2. between transient and non-transient boys
3. between transient girls and transient boys
4. among girls who have varied numbers of transfers
5. among boys who have varied numbers of transfers
6. among girls and boys with varied numbers of transfers
7. among students who, in the last transfer, have transferred from one school to another within the Edmonton R.C. Separate School System, to the system from other systems in the province of Alberta, or to the system from other than Alberta schools
8. among transient students with varied ability; namely, among groups with Otis scores of 109 or less, 110-129, and 130 or higher

Multiple linear regression was used to test the ninth hypothesis:

9. There are no significant differences in the achievement of students who have term transfers only, those who have summer transfers only, and those who have had both term and summer transfers.

Unless the five per cent level of significance was attained, the null hypothesis was considered tenable, and the research hypothesis was rejected.

Results

The results of the analysis are presented for each of the hypotheses tested.

Hypothesis 1: Transient/Non-Transient Girls

Table I summarizes the differences in achievement between transient and non-transient girls. The results of the tests indicate significant differences in achievement in favour of non-transient girls in three subjects. Although the differences in spelling and reading are not statistically significant, the direction of the difference also favours the non-transient group.

TABLE I  
STATISTICAL COMPARISON OF ACHIEVEMENT BETWEEN  
TRANSIENT AND NON-TRANSIENT GIRLS

| Subject    | Adjusted Means |       | N   | Adjusted F | P     |
|------------|----------------|-------|-----|------------|-------|
| Arithmetic | Transient      | 80.07 | 374 | 9.43       | < .01 |
|            | Non-tran.      | 82.22 | 311 |            |       |
| Language   | Transient      | 69.47 | 374 | 5.69       | < .05 |
|            | Non-tran.      | 70.95 | 311 |            |       |
| Science    | Transient      | 72.71 | 374 | 12.46      | < .01 |
|            | Non-tran.      | 75.06 | 311 |            |       |
| Spelling   | Transient      | 85.24 | 374 | 2.26       | NS    |
|            | Non-tran.      | 86.43 | 311 |            |       |
| Reading    | Transient      | 67.74 | 319 | 2.57       | NS    |
|            | Non-tran.      | 69.00 | 303 |            |       |



Hypothesis 2: Transient/Non-Transient Boys

The only significant difference in achievement between the transient and non-transient groups of boys was observed in language. Other mean differences tended to be slight; however, as was the case for girls, the differences consistently favoured the non-transient group.

TABLE II  
STATISTICAL COMPARISON OF ACHIEVEMENT BETWEEN  
TRANSIENT AND NON-TRANSIENT BOYS

| Subject    | Adjusted Means |       | N   | Adjusted F | P     |
|------------|----------------|-------|-----|------------|-------|
| Arithmetic | Transient      | 81.70 | 326 | 2.13       | NS    |
|            | Non-tran.      | 82.73 | 330 |            |       |
| Language   | Transient      | 64.79 | 326 | 3.77       | < .05 |
|            | Non-tran.      | 66.09 | 330 |            |       |
| Science    | Transient      | 75.90 | 326 | 1.04       | NS    |
|            | Non-tran.      | 76.61 | 330 |            |       |
| Spelling   | Transient      | 80.85 | 326 | .004       | NS    |
|            | Non-tran.      | 80.91 | 330 |            |       |
| Reading    | Transient      | 66.66 | 292 | .02        | NS    |
|            | Non-tran.      | 66.78 | 313 |            |       |

Hypothesis 3: Transient Girls/Transient Boys

On the basis of previous research and theorizing it was hypothesized that the effects of transiency on boys and girls might be differential. In order to test this hypothesis the achievement of transient girls was compared with that of transient boys in each of the five subject areas under study. The comparison of the achievement in Table III shows some inconsistency. Transient girls achieved significantly higher in language

TABLE III  
STATISTICAL COMPARISON OF ACHIEVEMENT BETWEEN  
TRANSIENT GIRLS AND TRANSIENT BOYS

| Subject    | Adjusted Means* |       | N   | Adjusted F | P     |
|------------|-----------------|-------|-----|------------|-------|
| Arithmetic | Tran. Girls     | 78.55 | 374 | 17.30      | < .01 |
|            | Tran. Boys      | 81.59 | 326 |            |       |
| Language   | Tran. Girls     | 67.91 | 374 | 26.99      | < .01 |
|            | Tran. Boys      | 64.58 | 326 |            |       |
| Science    | Tran. Girls     | 70.93 | 374 | 45.62      | < .01 |
|            | Tran. Boys      | 75.70 | 326 |            |       |
| Spelling   | Tran. Girls     | 83.47 | 374 | 12.50      | < .01 |
|            | Tran. Boys      | 80.63 | 326 |            |       |
| Reading    | Tran. Girls     | 65.56 | 319 | .98        | NS    |
|            | Tran. Boys      | 66.32 | 292 |            |       |

\*Since means were adjusted in each analysis, according to variables and groups under study, numerical values of mean achievement scores for the same group differ from table to table.

and spelling; transient boys achieved higher in arithmetic and science. The difference in mean reading scores for the two groups was not statistically significant.

Because these findings seem to mirror normal sex differences in achievement, a further comparison of achievement was made between non-transient girls and non-transient boys. The comparisons presented in Table IV seem to indicate that the results of the initial analysis reflect the effect of something more than the usually encountered sex difference in achievement.

TABLE IV  
STATISTICAL COMPARISON OF ACHIEVEMENT BETWEEN  
NON-TRANSIENT GIRLS AND BOYS

| Subject    |       | Adjusted Means | N   | Adjusted F | P     |
|------------|-------|----------------|-----|------------|-------|
| Arithmetic | Girls | 82.79          | 311 | 3.54       | NS    |
|            | Boys  | 84.04          | 330 |            |       |
| Language   | Girls | 71.48          | 311 | 36.81      | < .01 |
|            | Boys  | 67.57          | 330 |            |       |
| Science    | Girls | 75.76          | 311 | 13.80      | < .01 |
|            | Boys  | 78.17          | 330 |            |       |
| Spelling   | Girls | 86.86          | 311 | 23.12      | < .01 |
|            | Boys  | 82.73          | 330 |            |       |
| Reading    | Girls | 69.44          | 303 | .51        | NS    |
|            | Boys  | 68.88          | 313 |            |       |

In the comparison of achievement between non-transient girls and non-transient boys, mean arithmetic scores were not significantly different as was the case for transients. Although the difference in science scores still favours boys, the magnitude of the difference is of some interest. The mean science score for non-transient boys exceeded the mean score for non-transient girls by 2.41 points ( $F = 13.80$ ) while the difference in science scores for the transient groups was 4.77 points ( $F = 45.62$ ). Although the differences in language and spelling favoured girls in both instances, the difference was greater for the non-transient than for the transient groups. This further analysis would seem to add support for the acceptance of the hypothesis that, as a group, girls are affected to a greater degree by transiency than are boys.

*Hypotheses 4 and 5: Number of Transfers*

In order to test the null hypotheses of no significant difference in achievement scores among girls with varied numbers of transfers and among boys with varied numbers of transfers, subjects were categorized as having one, two, three, four or five transfers during their school careers. The hypotheses were tested by means of analysis of covariance.

The results showed no significant differences in any achievement test area among girls with varied numbers of transfers. Similar results were



obtained for boys in all subjects except science in which case there was a difference, significant at the .01 level, between groups with varied numbers of transfers. Further analysis revealed that boys with three or fewer transfers achieved significantly higher than did boys with either four or five transfers. Mean science scores for the five groups were 75.90, 75.26, 75.91, 72.75 and 65.46 respectively. Although a similar trend was observed for arithmetic achievement, the difference was not statistically significant. These findings seem to suggest that the number of transfers may be a more significant variable in affecting the achievement of boys than that of girls.

*Hypothesis 6: Girls/Boys With Varied Numbers of Transfers*

The possibility that transiency may have a differential effect on the achievement of boys and girls was tested further. The achievement of boys was compared with that of girls for groups who had one, two, three, four, and five transfers. The results of the analysis are presented in Table V.

TABLE V  
STATISTICAL COMPARISON OF ACHIEVEMENT BETWEEN GIRLS AND BOYS  
WITH VARIED NUMBER OF TRANSFERS

| Subject    | Transfers | Girls | Boys | Girls | Boys  | F     | P     |
|------------|-----------|-------|------|-------|-------|-------|-------|
| Arithmetic | 1         | 188   | 168  | 79.80 | 82.45 | 6.42  | < .01 |
| Language   |           | 188   | 168  | 69.24 | 65.43 | 18.29 | < .01 |
| Science    |           | 188   | 168  | 72.49 | 76.91 | 20.22 | < .01 |
| Spelling   |           | 188   | 168  | 83.91 | 80.95 | 7.13  | < .01 |
| Reading    |           | 168   | 148  | 66.39 | 66.17 | .04   | NS    |
| Arithmetic | 2         | 96    | 82   | 76.44 | 80.47 | 6.92  | < .01 |
| Language   |           | 96    | 82   | 66.58 | 63.59 | 5.95  | < .05 |
| Science    |           | 96    | 82   | 69.06 | 74.43 | 13.79 | < .01 |
| Spelling   |           | 96    | 82   | 83.10 | 80.17 | 3.59  | NS    |
| Reading    |           | 81    | 78   | 64.11 | 65.04 | .39   | NS    |
| Arithmetic | 3         | 42    | 47   | 77.95 | 83.53 | 10.68 | < .01 |
| Language   |           | 42    | 47   | 66.76 | 64.28 | 1.92  | NS    |
| Science    |           | 42    | 47   | 69.75 | 77.14 | 16.46 | < .01 |
| Spelling   |           | 42    | 47   | 82.14 | 80.73 | .31   | NS    |
| Reading    |           | 39    | 41   | 63.85 | 69.44 | 7.20  | < .01 |
| Arithmetic | 4         | 29    | 17   | 78.53 | 76.98 | .25   | NS    |
| Language   |           | 29    | 17   | 67.13 | 62.72 | 2.36  | NS    |
| Science    |           | 29    | 17   | 69.85 | 72.79 | 1.22  | NS    |
| Spelling   |           | 29    | 17   | 82.47 | 81.14 | .13   | NS    |
| Reading    |           | 21    | 16   | 67.94 | 65.57 | .52   | NS    |
| Arithmetic | 5         | 19    | 12   | 77.63 | 77.01 | .03   | NS    |
| Language   |           | 19    | 12   | 64.52 | 64.27 | .003  | NS    |
| Science    |           | 19    | 12   | 68.72 | 66.78 | .24   | NS    |
| Spelling   |           | 19    | 12   | 84.19 | 80.29 | 1.00  | NS    |
| Reading    |           | 10    | 9    | 65.61 | 66.33 | .02   | NS    |

A comparison of the achievement for boys and girls who had had one transfer shows that the girls achieved significantly higher in language and spelling; the boys achieved higher than did the girls in arithmetic and science. When comparisons were made for groups who had two and three transfers, boys retained their superiority in arithmetic and science, and they added reading at the third transfer level.

There were no significant differences in achievement between boys and girls after the third transfer; achievement differences between the sexes appear to be reduced by increasing numbers of transfers.

*Hypothesis 7: System Transfer/Province to System/Other*

It was hypothesized that there would be no significant difference in achievement among groups whose last transfer was within the system, to the system from another Alberta school, or from outside of the province to the school system. Since most of the last transfers occurred within the system, the analysis was hampered somewhat by the relatively small N's for the last two categories. Table VI presents the results of the analysis for girls, and Table VII includes results for boys.

No significant difference in achievement was observed in any subject among the three groups for either boys or girls; the null hypotheses were accepted. It would appear that the achievement of students whose last transfer was within the school system is affected in much the same way as is that of students whose last transfer was into the system from other districts within the province or from outside the province.

TABLE VI  
STATISTICAL COMPARISON OF ACHIEVEMENT AMONG GIRLS  
ACCORDING TO TYPE OF LAST TRANSFER

| Subject    | Last Transfer | N   | Adjusted Means | Adjusted F | P  |
|------------|---------------|-----|----------------|------------|----|
| Arithmetic | System        | 272 | 78.95          | 1.75       | NS |
|            | Province      | 74  | 77.92          |            |    |
|            | Other         | 28  | 81.94          |            |    |
| Language   | System        | 272 | 68.51          | 2.51       | NS |
|            | Province      | 74  | 66.76          |            |    |
|            | Other         | 28  | 70.59          |            |    |
| Science    | System        | 272 | 71.74          | 1.25       | NS |
|            | Province      | 74  | 69.89          |            |    |
|            | Other         | 28  | 71.71          |            |    |
| Spelling   | System        | 272 | 83.55          | 1.59       | NS |
|            | Province      | 74  | 84.54          |            |    |
|            | Other         | 28  | 87.08          |            |    |
| Reading    | System        | 236 | 65.74          | 1.48       | NS |
|            | Province      | 60  | 67.97          |            |    |
|            | Other         | 23  | 67.00          |            |    |



TABLE VII  
STATISTICAL COMPARISON OF ACHIEVEMENT AMONG BOYS  
ACCORDING TO TYPE OF LAST TRANSFER

| Subject    | Last Transfer | N   | Adjusted Means | Adjusted F | P  |
|------------|---------------|-----|----------------|------------|----|
| Arithmetic | System        | 245 | 80.58          | 1.56       | NS |
|            | Province      | 53  | 82.39          |            |    |
|            | Other         | 28  | 83.33          |            |    |
| Language   | System        | 245 | 64.30          | 2.68       | NS |
|            | Province      | 53  | 61.94          |            |    |
|            | Other         | 28  | 66.46          |            |    |
| Science    | System        | 245 | 75.19          | .16        | NS |
|            | Province      | 53  | 74.76          |            |    |
|            | Other         | 28  | 76.04          |            |    |
| Spelling   | System        | 245 | 80.14          | 1.15       | NS |
|            | Province      | 53  | 78.32          |            |    |
|            | Other         | 28  | 72.06          |            |    |
| Reading    | System        | 220 | 65.30          | .64        | NS |
|            | Province      | 47  | 65.80          |            |    |
|            | Other         | 25  | 67.56          |            |    |

#### *Hypothesis 8: Transient Students of Varied Ability*

In order to test whether transiency had a differential effect on achievement of different ability groups, comparisons were made for transient students in "low", "medium", and "high" ability categories. The Otis IQ levels for these groups were 109 or under, 110 to 129, and 130 or over respectively. Only one significant difference was observed in the comparisons in both boys' and girls' groups. When achievement was adjusted for differences in ability, transient girls in the lower ability group showed higher achievement in spelling than did the girls in the other two groups. Since this was only one significant difference in ten comparisons, it was concluded that transiency does not have a differential effect on groups with different ability levels.

#### *Hypothesis 9: Term Only/Summer Only/Both Term and Summer Transfers*

This hypothesis was proposed to determine whether the time of transfer was related to the achievement of transient students. The major statistical approach applied was multiple linear regression which permitted the use of various predictors including the time of transfer, the total number of transfers, and the combination of time and number of transfers. In general it was found that:

1. The variable *summer transfers only* was significant in predicting reading achievement in the presence of I.Q., sex, occupation of parent, and total number of transfers.

2. The variable *total number of transfers* was significant in predicting arithmetic, science, and reading achievement of students who had summer transfers only in the presence of I.Q., sex, and occupation of parent.

3. The variable *sex* was significant in predicting arithmetic, language, and science achievement of students who had summer transfers only and in predicting spelling achievement of students who had both term and summer transfers. In this analysis I.Q., occupation, and total number of transfers were held constant.

The finding that the variables of sex and number of transfers were significant predictors of the achievement of students for those who have had summer transfers only suggests that the fact of the transfer was not as significant as it was when the transfer occurred at some other time. Results also showed that the students who transferred during the summer achieved significantly higher than did those who transferred at any other time of the year. This was particularly evident for girls. On the basis of the evidence, the null hypothesis was rejected in favour of the research hypothesis.

### *Conclusions*

The following conclusions are based on the results of the analyses carried out in testing the hypotheses:

1. Transiency does affect achievement; however, it would appear that it has a greater effect on the achievement of girls than on that of boys.

2. The number of transfers is not too significant in relation to the achievement of transient girls; those who transfer once are affected to almost the same extent as those who have several transfers. The achievement of transient boys was not affected as much by the initial transfer as it was by increasing numbers of transfers.

3. Transfers within a school district have much the same effect on achievement as transfers from outside the district even if it is an inter-provincial transfer.

4. Transiency affects the achievement of students, particularly girls, at all levels of ability.

5. The time of transfer is significant; the achievement of students who transfer during the summer is less affected than is that of students who transfer at any other time of the year.

### *Implications*

The findings of and conclusions derived from this study have some direct implications for educational practice. In general, the research provides further evidence for the need to look upon all transfer students as individuals who require special attention if they are to achieve to the highest level of their academic ability; however, the specific nature of the attention is something which requires further thought and study. On the one hand it seems obvious that proper academic placement and an



appropriate concern for curricular or content problems are essential. It is also evident that giving attention only to academic placement of the transfer student is not sufficient; other factors and conditions must also be taken into account. The observation that the type of transfer is not as significant as might be expected, that the time of the transfer makes a difference, and that there may be a differential effect on boys and girls suggest strongly that factors other than academic placement and adjustment need to be considered. There may well be problems of adjustment to a new school situation which are at the basis of and which underlie the outward manifestation of reduced academic achievement. The lowered achievement may be symptomatic of problems of adjustment to school, teacher, and classmates that may result in strains on the average transfer student which are not evident in an examination of the effects on achievement. Teachers and administrators might well direct their attention to some of these problems and attempt to devise ways of assisting students in making adjustments to a new school situation.

It would also appear that attempts to meet the problems of transiency by standardization of programs and curricular content are not likely to be effective. Either there is not as much variation in content within districts, where there supposedly exists some standardization, as there is among districts, or it is the fact of a transfer and not problems of dealing with curricular content which leads to lowered levels of achievement. Each of these is probably true to some extent; therefore, more effective solutions to the problems of transfer students would involve adjusting transfers so that these take place during the summer as much as possible and developing programs designed to aid students to adjust to a new school. The nature of these programs merits the attention of administrators, teachers, and specialist personnel in school systems, as well as of educational researchers who might strive to provide further insights to serve as a basis for action programs.

#### REFERENCES

- <sup>1</sup> Helen Huus, "Factors associated with the reading achievement of children from a migratory population." *Elementary School Journal*, Vol. 45 (December, 1944), pp. 203-212; and Vol. 45 (January, 1945), pp. 276-285.
- <sup>2</sup> Joan Bollenbacher, "A study of the effect of mobility on reading achievement," *The Reading Teacher*, Vol. XV (March, 1962), pp. 356-360.
- <sup>3</sup> Varden Fuller and E. D. Tetreau, "Some factors associated with the school achievement of children in migrant families," *Elementary School Journal*, Vol. XLIII (February, 1942), pp. 424-431.
- <sup>4</sup> Jean Howard Munzer, "A study of the relationships between mobility and academic achievement of third-grade and sixth-grade children," unpublished Master's thesis, The University of Michigan, 1961 (Microfilm).
- <sup>5</sup> Verner R. Nyberg, "A study to determine the effect of transiency on grade nine departmental examination marks." *Alberta Journal of Educational Research*, Vol. II (September, 1956), pp. 151-155.

- <sup>6</sup> Sister Mary Annata Brockman, "Relationship between transiency and test achievement of grade six students," unpublished Master's thesis, The University of Alberta, 1965.
- <sup>7</sup> See: Research and Evaluation Committee, "The survey as regards the core curriculum for Canada," *The Canadian Home and School and Parent-Teacher Federation* (Toronto: National Office Incorporated, 1962), pp. 1-4.
- <sup>8</sup> Research and Information Division, "Interprovincial transfers—the magnitude of the problem," *Information Bulletin*, Report No. 5 (Toronto: Canadian Education Association, 1965), pp. 1-17.
- <sup>9</sup> See for example: Coordinator of Testing and Research, "A study of Alberta school pupils who transferred during the period from July 1, 1962 to June 30, 1963," (Edmonton: Department of Education, 1963) (Mimeographed).
- <sup>10</sup> See for example: Research and Evaluation Committee, "The survey as regards the core curriculum for Canada," *loc. cit.*
- <sup>11</sup> Bernard R. Blishen, "The construction and use of an occupational class scale," in Bernard R. Blishen, Kaspar D. Naegle, and John Porter (editors), *Canadian Society* (Toronto: The Macmillan Company of Canada, 1961), pp. 481-484.



*Because education bestows benefits on society beyond those obtained directly by the student, the government must stimulate greater allocation of our resources to education than would originate from purely personal decisions. Of the several alternatives available the tax credit scheme recently recommended by the Royal Commission on Taxation warrants the most serious consideration.*

V L A D I M I R   S A L Y Z Y N

*The University of Alberta*

## Income Tax Concessions and Post-Secondary Education

### *Introduction*

There is a strong and undeniable rationale for governmental provision of educational services. This gives due recognition to the fact that education bestows benefits on society beyond those obtained directly by the individual in the form of greater income and personal satisfaction. Not only does education improve the social and political environment but it also enhances the productivity of the labour force permitting greater national output and/or the increased enjoyment of leisure.

A strong onus is placed upon the government to insure that more of our resources are allocated to educational facilities than would be if such decisions were left entirely in the hands of the private sector of the economy. The proper balance is struck when students pay directly for only that portion of education from which they derive benefit as individuals. It is only under this condition that the total expenditures on education by the government and by individuals will automatically equal the benefits of education to society as a whole, insuring the maximization of total social welfare.

### *The Role of Tax Concessions*

What specific function can tax concessions be expected to perform in education? The obvious answer is that tax concessions can be used to

encourage greater use of education through reductions in the costs incurred by the individual.

There are, however, several important implications associated with the granting of tax concessions through the personal income tax. First, since the concessions are alternatives to increased grants to educational institutions (enabling them to lower tuition fees to the level at which they represent only the private benefits of education), such concessions are justified only when direct governmental expenditures on education are considered to be too low. And if these direct expenditures are too low, the best solution may simply be to raise them to the desired level. At least in such a case the taxpayers will be more aware of the contribution which is ultimately required under either approach. Administration problems would also be greatly reduced.

Tax concessions, however, shift the burden from other taxes to the personal income tax. This is a very desirable shift from the point of view of ability to pay. It also means that part of the burden of providing education is automatically borne by the federal government. A desirable shift is achieved without the usual interpretations and negotiations associated with the allocation of constitutional responsibilities.

The case for the use of tax concessions as a deliberate alternative to increasing the budget of post-secondary educational institutions may not be too decisive, but, nonetheless, it is sufficiently strong to warrant careful weighing of its advantages.

#### *Current Tax Concessions*

Current income tax legislation provides special treatment for tuition fees paid to a "university, college or other educational institution providing courses at a post-secondary school level" by way of deductions from income.<sup>1</sup> All tuition fees paid for the right to attend a Canadian post-secondary educational institution during any 12-month period commencing in the taxation year can be deducted in computing income, except that the minimum deduction allowed is \$25. This provision in the Income Tax Act also applies to attendance at universities outside Canada, provided the student is in full-time attendance in a degree course of no less than 13 consecutive weeks' duration. Tuition fees may be claimed as a deduction from the student's income only. This deduction from income may affect either the student's own tax liability directly or that of his parents since the deduction can alter the student's dependant status as well as determine his degree of dependence.

#### *Recommendation of the Royal Commission on Taxation*

The Royal Commission on Taxation, in its comprehensive blueprint for a Canadian tax system, recommended that the present deduction



allowance from taxable income be removed and a tax credit which reduces taxes by a given amount be substituted. Specifically, the recommendation is that:

There should be a tax credit of one quarter of the fees paid by or on behalf of the student to the post-secondary educational institution.<sup>2</sup>

The Commission claims that the switch from a deduction to a tax credit would be more equitable. In support of this position the Commission notes that the credit would be relatively more valuable to lower income tax units than to higher income tax units.

The tax credit recommended by the Commission implies that students at post-secondary educational institutions are currently paying tuition fees for the benefits they receive directly plus an additional one-third for the benefit of society as a whole and that this additional one-third should be refunded to the students through the tax system.

#### *Tax Credits or Deductions from Income?*

If the currently held general belief that Canada should encourage greater participation of its population in improving its education is accepted, more of our resources should be allocated to this function. To the extent that grants to post-secondary educational institutions are unlikely to increase rapidly enough, tax concessions, equal to the difference between tuition fees and the value of exclusively private benefits, should be used to encourage education. If this difference does not change as the level of income of the taxpayer changes, standard tax credits which reduce the tax bill directly are obviously the most equitable form of concessionary allowance.

The deduction of fees from income currently permitted by the Income Tax Act offers greater benefits to higher income groups because of marginal tax rates which increase as income increases. Deductions from income would be fair only if the benefits of the individual's education which accrue to society increase at the same rate as the value of the concession (i.e., increase at the same rate as the marginal income tax rates). Since this is unlikely, the recommendation of the Royal Commission on Taxation deserves strong support.

There is, however, one qualification worth noting. If it can be established that benefits to society are greater when a given amount of educational resources are shifted from higher income groups to lower income groups, a diminishing tax credit may be preferred to the one recommended by the Commission. Since the social benefits derived from education take primarily the form of "the quality of our society,"<sup>3</sup> sufficient support for this proposition may not be too difficult to obtain.

Furthermore, any shift of educational resources to lower income groups could be performed effectively only through tax concessions. It

would be virtually impossible to devise a scheme whereby greater funds allocated directly to educational institutions could be used to achieve this shift with any reasonable degree of efficiency.

#### REFERENCES

- <sup>1</sup> *Income Tax Act*, Section 11 (1) (qc) (i), as amended by *Statutes of Canada*, 1966-67, Chapter 47, Section 1. (Ottawa: Queen's Printer, 1967).
- <sup>2</sup> *Report of the Royal Commission on Taxation*, (Ottawa: Queen's Printer, 1967), Volume 3, p. 236.
- <sup>3</sup> *Ibid.*, Volume 3, p. 230.



## AN AUSTRALIAN SCHOOL AT WORK

By K. S. Cunningham and Dorothy J. Ross (*Hawthorn: Australian Council for Educational Research, 1967*).

The announced purpose of this monograph is to bolster the cause of the comprehensive school in Australia. The monograph proceeds by providing, in its initial chapters, curt comment on the idea of the comprehensive school and on "principles and problems in secondary education." These chapters belong to Dr. Cunningham and, indirectly, to W. F. Connell's precursory volume in this series, *The Foundations of Secondary Education*, (Hawthorn: A.C.E.R., 1962). The following chapters, supported by appendices, describe the organization of Melbourne Church of England Girls' Grammar School (MCEGGS) under Miss Dorothy Ross, Headmistress from 1939 to 1955. This description purports to substantiate a concept of the comprehensive school by citing its practical success at MCEGGS. These descriptive chapters, with the exception of the final one, were assembled by Dr. Cunningham from information supplied predominantly by Miss Ross and partly by former MCEGGS staff members, notably Cunningham's daughter. The final chapter belongs to Miss Ross. Throughout, the authors convey these descriptions easily, avoiding frippery. This felicity of style supports a most ardent mission on behalf of the comprehensive school.

Much of the mission evinces in the two initial chapters. Into these chapters, Dr. Cunningham sweeps a melange of fact and ideal, collected from many disciplines, purposing attack on the traditional concept of the Australian secondary school. The attack is much too conventional and much too broad to generate converts to the comprehensive school idea. This school, rooted in tenets of democracy, is seen as the preferred solution to the goal of universal education through all the years of secondary school. Consequently, this school emerges as the antidote to the traditional concept of selective, academic secondary education. Furthermore, it remedies the essentially undemocratic aspects of the traditional school. These broad statements, by this reviewer, mirror Dr. Cunningham's approach. It is an approach in which issues tend to become polarized between the good (comprehensive schools) and the harmful (selective schools).

Most mischief occurs, however, with insinuated comparisons. For instance, career and subject guidance, library services, and audio-visual aids are espoused as "special features" of the comprehensive school. Implications abound that other than comprehensive schools lack democratic administration, forbid classroom discussions of social issues, develop the "poison viruses of prejudice", inadequately prepare pupils for "responsible adulthood", emphasize formal examination based on memorization, neglect to cater for all "relevant needs" of adolescents, and

operate in a quaintly authoritarian manner. This polarization of issues is unfortunate since it makes vulnerable the concept of the comprehensive school; yet it is a concept which intrinsically compels attention.

The comprehensive school appeals particularly as an instrument for achieving social and educational equality of opportunity. As the historic solution to the problem of assimilating many different peoples into the United States, the comprehensive school consequently appeals very strongly to countries faced with extending secondary education opportunities within a school system partly stratified on the basis of social class. This focus on the school's power as a social corrective is at once its justification and its provocation. Advocates argue plausibly for the kind of society to which they aspire, but their premises may be doubtful. The initial presumption that society is presently divisive stands unsupported by evidence. Also, the presumption that American experience has been successful ignores the aggravations issuing from residential segregation.

Faced with using MCEGGS (a non-government school charging fees) as a viable example of a comprehensive school, Dr. Cunningham hedges on the social mixing imperative and concentrates on the school's ability to function as a democratic organization. Democratic practices are championed for administrative and classroom relationships, with consequent accent on consideration of teachers and pupils as persons. But the assertion that democratic activities and practices are innately peculiar to the comprehensive school is mischievous. In fact, Dr. Cunningham's arguments combine to describe qualities of any good school rather than to support distinctively comprehensive characteristics. As Dr. Cunningham notes, the crucial variable in a school's success is found, "Above all . . . in the quality of human relationships throughout the school" (p. 21). While democratic practices are more likely to generate harmonious and beneficial relationships, they are not the sole prerogative of the comprehensive school.

It is as an instrument for achieving educational equality of opportunity that the comprehensive school stands strong. In this regard, Dr. Cunningham's idea of the comprehensive school builds on a heterogeneous student body enjoying courses cut to individual levels of ability and interest, and arranged so flexibly that program transfers are possible until the penultimate school year. Thus educational equivalence (or parity of esteem) and individual development (allowing for discovery and cultivation of abilities) would be achieved. Diverse programs would attract students from every socio-economic class thereby satisfying the social mixing imperative. This concept of the comprehensive school divorces the multi-lateral, composite school. In making the distinction precise, Dr. Cunningham marks the comprehensive school's power as an educational agency and corrective, allowing him to state with equanimity, "On the organizational side, the genuine believer in the right of all children to have the best education of which they are capable will find . . . nothing to condemn in the comprehensive school" (p. 15).



MCEGGS provides an illustration of this concept of the comprehensive school. After two years of a common curriculum, MCEGGS secondary girls could opt for an academic or practical orientation, selecting individual combinations of subjects according to interests and ability. It was possible to change orientation "almost up to the final year of schooling" (p. 43). Ability groupings (sets) were established for Mathematics, Foreign Languages, and some Sciences since these were subjects marked by sequential learning. Classes based on friendship choices for English, Singing, Scripture, Physical Education, and Social Studies secured some cohesion and stability in the school where perhaps only one in fifteen pupils operated on identical timetables.

The monograph becomes a splendidly practical manual as it details the organization of timetables and curricula, specifies procedures for assessment and guidance, and elaborates techniques for achieving self-government among staff and pupils. Lengthy appendices provide illustrative supporting material. Further, in each chapter, pithy theoretical discussions introduce the descriptions of procedures at MCEGGS. These chapters contribute a brisk and precious portrayal of a remarkable school. Further, they at once attest to the non-government school's capacity to innovate, and afford a testimonial to an unusual, forward-thinking headmistress.

But the monograph is incomplete, for the descriptions derive from Miss Ross's viewpoint, and with Miss Ross comprehensivism is an attitude of mind. The reader wonders about characteristics of pupils and staff. Particularly of staff, for Miss Ross demands "teachers who are masters of their craft", who employ "different teaching methods . . . in the different sets" while, in whole class groups of mixed ability, they use "different methods of accommodating individual differences." None of these statements is elaborated. In essence, the monograph gives an excellent description of a formal structure, of the manner in which a comprehensive static organization can function, but it is not entirely convincing.

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## ALTERNATIVE DIRECTIONS FOR THE SOCIAL STUDIES

*By Dale L. Brubaker, (Scranton, Pennsylvania: International Textbook Co., 1967).*

This book was primarily intended for secondary school teachers and curriculum committees who are looking for ways to improve current social studies offerings. The author adopts the position that before attempting to alter existing programs, one must carefully consider the goals the social studies course is attempting to accomplish. With this in mind, Brubaker reviews and contrasts the two most prevalent approaches educators have taken towards this subject area, that is, citizenship education (whatever that may mean) and social science inquiry.

The first of the book's three chapters is devoted to an examination of the arguments of those who favour the "good" citizenship approach. Brubaker terms this the majority position and discusses such questions as whether the teaching of values is possible or desirable and whether good citizenship and social science inquiry are compatible goals for the social studies.

The author concludes that if 'citizenship' is defined as a belief in the superiority of the American way of life in all things, the goals are not compatible. However, if it is defined so that free inquiry into the values of society is welcomed, then the problem is resolved.

The viewpoint of those who favour the social science approach is described in the second chapter. While calling this the minority position, Brubaker presents an equally strong case for the use of this method. Again, the question of values is discussed and the dangers one may encounter in encouraging students to question society's established value system.

The third and last chapter discusses the Soviet Union and how it deals with citizenship education and social science inquiry. While quite interesting in its own right, the relevance of this chapter to the previous two seems to be somewhat obscure.

Two of the best features of this very short text are the extensive footnotes and references at the end of each chapter and the selected bibliography. Both should provide many leads to further exploration in the area.

In conclusion, this reviewer found the book to be a good, if somewhat short, review of the two major approaches to the social studies and a guide to many of the major references dealing with the subject. The work could be used to advantage by curriculum committees and students of education, but in either case, it would have to be supplemented by texts which would deal with the subject in more detail.

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## THE PSYCHOLOGY OF THE USE OF AUDIO-VISUAL AIDS IN PRIMARY EDUCATION

*By G. Mialaret, (Paris: George G. Harrap and Company Ltd. and the United Nations Educational, Scientific and Cultural Organization, 1966).*

Professor Mialaret is Director of the Laboratoire de Psychopédagogie at the University of Caen. In the spring of 1962 he participated in a seminar on audio-visual education sponsored by the United Nations and held at the University of Caen. Six other French delegates attended the seminar along with one educator from each of England, Canada, United States, Belgium, Italy, and Thailand, and two from UNESCO. The book reports much of what transpired at the Caen conference in addition to material from the author's research and thinking on the subject.

In outlining some of the kinds of research in education, together with some of the attendant problems, Professor Mialaret indicates three basic laws regarding his treatment of data in the present text (p. 21):

1. Contact should be maintained between scientific research and its application in the teaching situation.
2. . . . prudence should always be exercised when it comes to interpreting results and giving advice to users; what is valid and excellent for certain subjects can be disastrous for those in another environment.
3. The problems involved in the educational and psychological aspects of audio-visual techniques are, by and large, so complex that very often research by teams is an essential pre-requisite of success.

With these observations and warnings in mind, Mialaret undertakes to survey the pertinent research on the subject.

After a consideration of the nature of perception, some of the characteristics of the perception of audio-visual experiences are considered. Three aspects of this experience are discussed: the situation, the audio-visual message, and the individual child. As factors important to the situation or environment, the effect of darkness, of being a member of a group, and of relaxation in a viewing position are considered. Discussed as physical components of the audio-visual message are sound, frequency, amplitude, harmonic composition, rate of signals, light and sound intensity, continuity, and rear, front and side projection. The structure of the message itself is discussed in terms of fidelity to reality, the variation in factors of time, space, and degree of agreement with the real world as compared to the imaginary. The psychological consequences of the relative phenomenological density of the message are also considered. The possible psychological differences in presenting audio-visual materials to groups and to individuals are contrasted. Some of the effects upon the individual when observing a screen instead of reality are listed, and the implications of several of these are explored.

An extensive review of research related to perception is included under the headings of visual perception, auditory perception, and audio-visual association. Investigations into the neurophysiological areas regarding eye movements and image perception and situation, and the importance of size of perceived objects, the position of the camera, and the perception of movement by children are discussed and the related research reported. Audiograms of speech in French, English, German, and Spanish are reproduced, and their relationship to audio aids in education is discussed. Some problems associated with the use of auditory classroom aids are identified as areas for further study.

Under the general topic of audio-visual association, a number of research areas are reported. These include the investigation of the relationship of the visual message to the auditory message on sound motion pictures, and some Russian research into the interactions of word and image in the mental activity of children. The considerations for the use of audio-visual methods in the teaching of languages are enumerated at the conclusion of the book's treatment of the basic phenomena of perception.

The author considers in detail some studies of empathy phenomena and the behavior of the child participant in audio-visual experiences. These studies relate to the degree of identification of the viewer with the screen performer, the differences between primary, intermediate, and adult viewers of teaching films, and the emotional responses of children of different ages, sexes, and sociological groups to selected film viewing. Studies related to the maturity required for the understanding of stationary pictures are reported. These have implications regarding the age level and extent to which filmstrips and still pictures are beneficial as teaching materials. Investigations of the understanding of "cinematographic language" are described. The uses of dissolves, fades, cuts, closeups, and juxtaposition of scenes were evaluated with audiences of children. Because the general story line cannot be followed by children under a given mental age, the film is proposed as a possible instrument for diagnosing intelligence. The potential of the cinema for motivating students is given special consideration, especially in relation to the recognition and consideration of problems and their solutions.

Among his conclusions, Mialaret presents some basic and stimulating considerations of the use of audio-visual materials and methods in education. He points out that the teacher's mastery of audio-visual techniques is essential to fulfilling the teacher's changing role in contemporary education, "Audio-visual techniques and all that constitutes modern information and publicity can be ignored by the teacher only at the risk of a further widening and deepening of the gap between school and everyday life." (p. 195) As characteristics of our times, audio-visual techniques should be used by the teacher and understood by the student as tools of modern communication. The use of these media is considered as freeing the teacher to capitalize on all types of experiences to enrich



her teaching. Audio-visual materials are especially emphasized as uniquely valuable in teaching psychology and educational methods. Specific advantages of audio-visual methods in these areas are illustrated.

As a serious attempt to report the recent research underlying the use and understanding of audio-visual materials for the improvement of education of primary grade children, this book deserves consideration by all members of the educational community. It is of special interest to administrators and members of faculties of education, especially those in departments of psychology and in curriculum and instruction. It is particularly provocative regarding areas for future research in the fields of psychology and instructional methods, and is illuminating in regard to the interest taken in serious research into audio-visual education outside the North American continent.

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## MODELS, METHODS, AND ANALYTICAL PROCEDURES IN EDUCATION RESEARCH

*By Joseph S. Hill and August Kerber (Detroit: Wayne State University Press, 1967).*

According to the authors, *Models, Methods, and Analytical Procedures in Education Research* is suitable for use as:

1. A basic textbook in introductory courses in research.
2. A textbook for courses in methods of educational research.
3. A textbook for an integrated course in statistics and research design.
4. A resource book for doctoral students and their advisors.
5. A resource book and guide for educational research conducted by personnel in school systems.

The book is divided into three parts. Part I provides a brief historical review of the philosophy of inquiry from Plato to the operations research of World War II. A brief discussion of the role of models and their characteristics concludes the section and provides a setting for the presentation of what the authors describe as the General Analogue Model of Educational Research, Part II. The elements of the model are listed as the problem, which may be translated into either hypotheses or general questions depending on the nature of the research, the definition of the universe, the selection of the sample, the collection of data, the processing of data, and the research decision.

In Part III, the authors attempt to apply the general model of educational research to the basic types of research. The basic types of research are defined as experimental, descriptive, action, and historical research.

Part IV consists entirely of statistical techniques and models. The topics covered include descriptive statistics, parametric and non-parametric techniques, factor analysis, game theory and linear programming.

The authors are to be commended for their courage in undertaking a project of this magnitude. One gains the impression that the book was intended as a self-contained bible of research methodology. The central theme of the book, a general model of educational research, has been faithfully followed throughout. In some examples the application of the model appears a bit contrived, especially in the section on action research. On the other hand, if the user follows the prescription laid down by the authors he will certainly be able to develop a defensible research design. The major criticism of the theme is that it represents a commitment to the Neyman-Pearson methodology, and in this respect acts as a set of blinders for the research endeavour. No mention is made in the book of the Bayesian approach to statistical inference. Perhaps this is because its use is still controversial among research methodologists, or perhaps because it is not as easily subsumed under the paradigm which the authors present.

The introductory section, on the history of inquiry, is brief and interesting—two rather admirable qualities in an introduction. The section on models may satisfy the purpose of providing an introduction to the general analogue model of educational research, but from a broader viewpoint, i.e., providing an insight into the importance of models in educational research, it is far too brief. Three classes of models are delineated: iconic, analogue, and symbolic. Each is described. No attempt is made to evaluate the appropriateness of these models to various educational research efforts, nor are any educational applications of the models provided as illustration. Thus, the title of the book which deludes us into hoping for a genuine treatment of models (an item which would have put the book beyond the ordinary) disappoints us.

The description of the components of the general model are detailed and to the point. The section on statistical hypotheses and in particular the discussion of the null hypothesis would leave the naive unconvinced and even confused. Three kinds of hypotheses are mentioned: magnitude, difference, and relationship. Hypotheses about structure might also have been mentioned. It might be argued that this is a special case of hypotheses of relationship, but from the authors' discussion this does not appear to be the case; furthermore, inclusion of such a category would have made the subsequent section on factor analysis more nearly fit the general model. Finally the specification of the levels of significance which are generally employed act to perpetuate robot decision markers.

The remainder of the amplification of the general model of research is adequate, except for the discussion on the evaluation of the experimental design in terms of the model, which is excellent.

In Part III where models of experimental research are discussed, no mention is made of the work by Campbell and Stanley. This is a serious



oversight as their treatment of designs in terms of possible inferential errors is both more comprehensive and more efficient than that of the present book. In particular the section on matching does not warn the researchers of the specific pitfalls of many matching designs.

In the reviewer's opinion, action research is not research but program evaluation, and therefore does not belong in a book concerned with research design. However, this is a personal prejudice. The historical research section is particularly well done. Discussion of this topic is generally sloughed off by competing texts, and as a result students rarely learn to carry out such projects or even to evaluate those carried out by others.

The final part of the book in which statistical procedures are discussed is mainly a cook-book approach to statistics. The discussion of the mode is belaboured, and the discussion of skewness is misleading. Skewness measurement is defined in terms of the mean, median and mode. Although this might be an easy way to measure skewness, it is not the most common way.

In the section on probability, several kinds of probability are described, but no mention is made of personal probability. The discussion of the normal distribution is characterized by diagrams that are inaccurate.

The chapters on the numerical aspects of sampling are much more difficult than the rest of the book, but the authors are to be commended for their inclusion.

The chapter on multiple correlation and regression includes a section on validity and reliability. Construct validity is dispatched in three sentences, and the material on reliability is at least ten years behind the times. The section on validity could have been improved with a discussion of the Campbell-Fiske multi-trait multi-method matrix, and the reliability section by a discussion of generalizability.

The discussion of parametric statistics is singularly undistinguished. A poor attempt is made to provide a rationale for the test and to indicate *why* assumptions are necessary. The treatment of analysis of covariance is indefensible. No attempt is made to provide a conceptual rationale of the tests using graphs and regression lines. Further, the mandatory test for homogeneity of regression is completely ignored.

Almost as bad as the treatment of analysis of covariance is the treatment of analysis of variance. The discussion of interaction effects and the decisions made about them is inadequate. The technique of testing main effects after a significant interaction has been found, without so much as plotting the interactions, is an example of the questionable techniques advocated in that section.

The second last chapter on factor analysis is so weak as to be of questionable value. The space devoted to an extended recipe for carrying out a centroid analysis could more profitably have been spent on a

discussion of the properties of various kinds of factoring, i.e., alpha, canonical, principal components and maximum likelihood, and a discussion of the relative merits of various analytic rotations both orthogonal and oblique.

The final chapter is an eye opening chapter which introduces researchers to the uses of linear programming and theories of games in educational research. The chapter is well developed and is one of the most significant contributions that the book makes.

In summary, a brief note of protest must be made to the publishers for the extremely small type used for the examples, and for the method of citation selected. The former is an annoyance; the latter is completely devoid of information bearing properties.

As a single text, *Models, Methods, and Analytical Procedures in Educational Research* is better than most of the handful of texts which cite the same objectives. The suggested retail price of approximately \$20 means, however, that its use as a text book should be compared to the use of two lower priced books such as Kaplan's *The Conduct of Inquiry* and Hays' *Statistics for Psychologists* which provide superior coverage of many topics.

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- Nay, Marshall and Chesley K. Brown, *Remarks on Knowledge of Science and Teaching Behaviour*, No. 2, June, 1967, pp. 97-102.
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- Schwartz, Jeanne, E. Mermelstein, E. Carr and D. Mills, *Training Techniques for the Concept of Conservation*, No. 3, September, 1967, pp. 185-200.
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- Thomson, K. H., *Religious Institutions in Alberta's "Public" Schools*, No. 1, March, 1967, pp. 65-73.
- Towler, J. O. and L. D. Nelson, *Spatial Concepts of Elementary School Children*, No. 1, March, 1967, pp. 43-50.
- Wickstrom, Rod A., *Pupil Mobility and School Achievement*, No. 4, December, 1967, pp. 311-318.





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